July 9, 1957 A. DEL RASO ET AL 2,798,378

AUTOMATIC MARINE GEOLOGICAL SAMPLE EXTRACTOR

Filed May 22, 1956 2 Sheets-Sheet 1

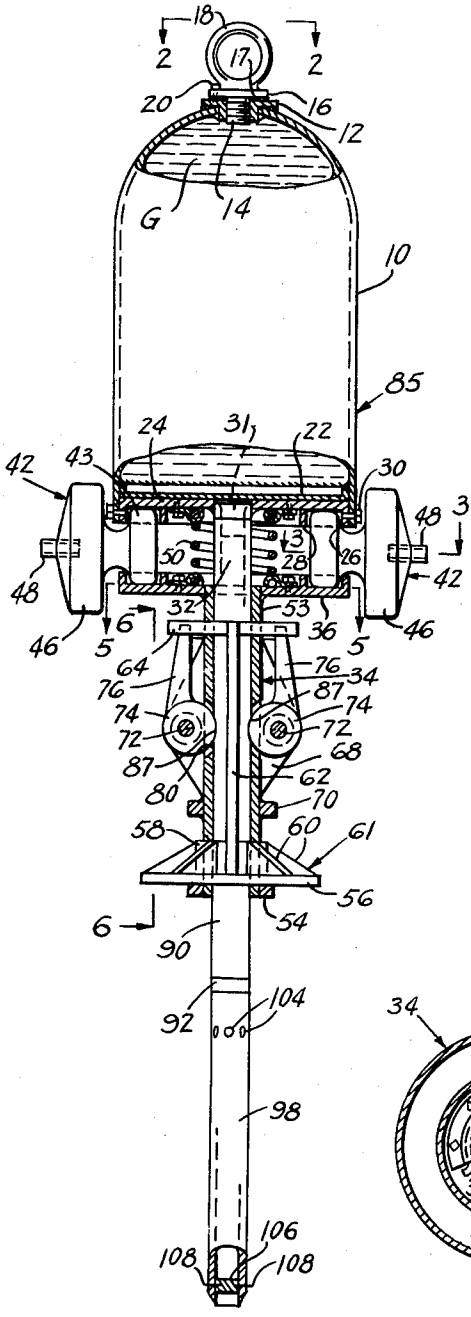


FIG. 1

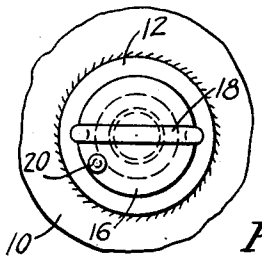


FIG. 2

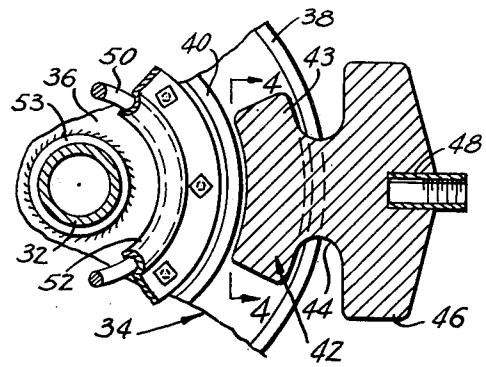


FIG. 3

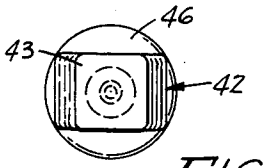


FIG. 4

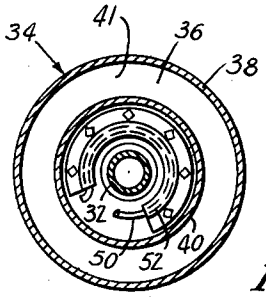


FIG. 5

INVENTORS
AMERICO DEL RASO
BY CHARLES J. SONICH

McMorrow, Berman & Davidson
ATTORNEYS

July 9, 1957 A. DEL RASO ET AL 2,798,378

AUTOMATIC MARINE GEOLOGICAL SAMPLE EXTRACTOR

Filed May 22, 1956 2 Sheets-Sheet 2

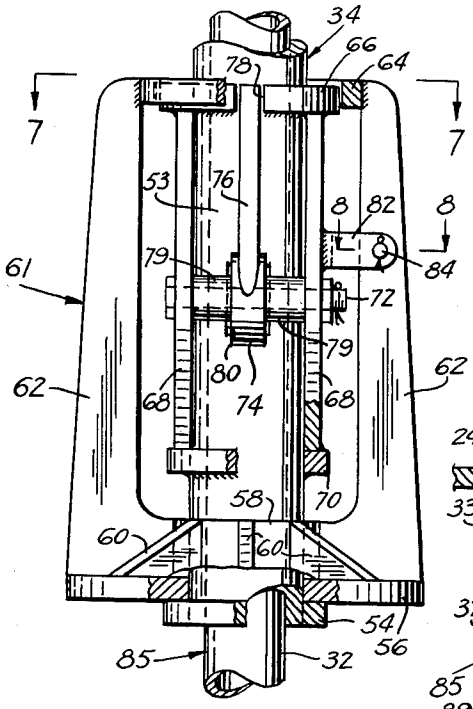


FIG. 6

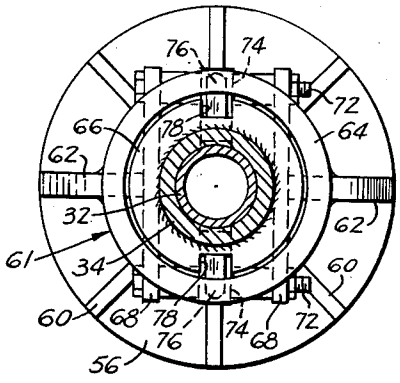


FIG. 7

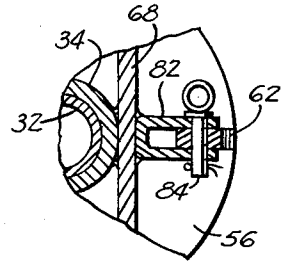


FIG. 8

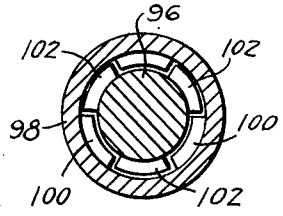


FIG. 10

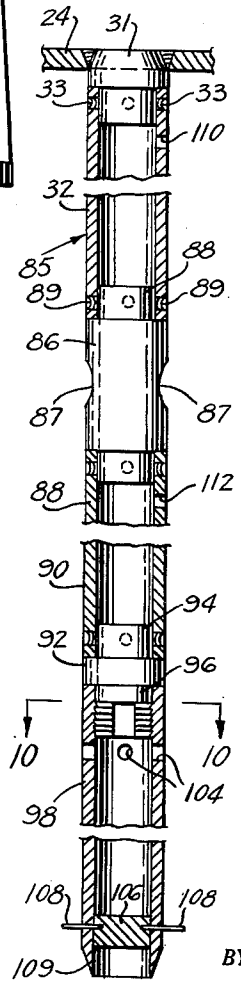


FIG. 9

INVENTORS
AMERICO DEL RASO
CHARLES J. SONICH
BY
McMorrow, Berman & Davidson
ATTORNEYS

United States Patent Office 2,798,378
Patented July 9, 1957

2,798,378

AUTOMATIC MARINE GEOLOGICAL SAMPLE EXTRACTOR

Americo Del Raso and Charles J. Sonich, Pittsburgh, Pa.

Application May 22, 1956, Serial No. 586,442
12 Claims. (Cl. 73—421)

This invention relates to an apparatus for taking earth cores or samples from the ocean bed.

It is of importance, during the making of geological surveys, to provide apparatus designed to be dropped overboard from a ship, and to descend to the ocean bottom, with said apparatus being adapted to take from the bottom a core of earth, which can then be drawn to the surface for the purpose of analysis.

Various devices have heretofore been conceived for the purpose of taking earth samples, and it may be stated that the broad object of the present invention is to provide a generally improved device of the character described.

Summarized briefly, the invention includes a device which initially is so weighted as to be caused to descend to the ocean bottom, with the weight of the device being adapted to cause penetration of a coring tube, into the ocean bottom. The device includes means which will engage the ocean bottom following penetration thereof by the coring tube and extraction of a sample, which means is adapted, responsive to pressure exerted upwardly thereon by the bottom, to disengage a latch assembly, in such a manner as to free a compressed spring for expansion. Expansion of the coil spring, caused automatically following full penetration of the bed and extraction of the sample, is in turn adapted to release weights, so that the device is now possessed of a buoyancy sufficient to cause the same to tend to return to the surface. Expansion of the spring is further adapted to cause extraction of the coring tube from the bottom, so that with the coring tube automatically extracted, and the weights automatically released, all by reason of upward pressure on the latch-releasing assembly exerted by the ocean bottom, ultimately the entire device is freed for travel, due to its inherent buoyancy following loss of the weights, to the surface with the sample.

Further summarizing the invention, it becomes apparent that the device, as distinguished from those previously conceived for the purpose of taking marine geological samples, automatically operates, when lowered to the bottom, to (1) first penetrate the ocean bottom and extract a sample; (2) release its ballast or weights so as to become buoyant and therefore rise to the surface of its own accord following taking of the sample; and (3) disengage itself from the ocean bottom, so as to become free for movement to the surface with the sample.

Among objects of importance are the following:

To provide apparatus of the character described which will be sure in operation, on each occasion of its use;

To so design the apparatus as to cause it to be fully automatic in operation, with the geologist being required to do no more than lower the apparatus to the bottom;

To eliminate the factor, heretofore persisting in prior art devices, of uncertainty as to whether a complete sample has been taken, and whether the device is ready to be brought to the surface; and

To so design the device as to permit it to be used at great depths without danger of malfunctioning, collapse, or other adverse results.

Other objects will appear from the following description, the claims appended thereto, and from the annexed drawing, in which like reference characters designate like parts throughout the several views, and wherein:

Figure 1 is a view of the device partly in elevation and partly in longitudinal section, as it appears when ready to be lowered to the bottom;

Figure 2 is an enlarged, fragmentary top plan view as seen from the line 2—2 of Figure 1;

Figure 3 is an enlarged, detail, transverse sectional view showing one of the weights and its associated jaw plate;

Figure 4 is an end elevational view, on the same scale as Figure 1, of one of the weights per se, as seen from the line 4—4 of Figure 3;

Figure 5 is a transverse section showing the lower jaw plate, taken on line 5—5 of Figure 1;

Figure 6 is a longitudinal sectional view on an enlarged scale, of the latch means and the latch release assembly, taken on line 6—6 of Figure 1;

Figure 7 is a transverse section, on the same scale as Figure 6, taken on line 7—7 of Figure 6;

Figure 8 is a detail sectional view, the scale being enlarged above that of Figure 6, taken on line 8—8 of Figure 6, showing a safety lock means embodied in the latch-release mechanism;

Figure 9 is an enlarged longitudinal section, portions being broken away, of the coring tube and main shaft assembly; and

Figure 10 is a transverse section, the scale being enlarged above that of Figure 9, taken on line 10—10 of Figure 9, showing quick-disconnect means embodied in adjacent sections of the coring tube and shaft assembly.

Referring to the drawings in detail, the reference numeral 10 designates a tank, having a dome shaped upper end, said tank being adapted to be completely filled with a quantity of a liquid lighter than water, such as high octane gasoline G. The tank 10 is thus, considered per se, made buoyant. The purpose of filling the tank with the gasoline G is to reinforce the same internally against collapse, during the taking of marine geological samples at great depths.

Welded in a center opening formed in the upper end of the tank 10 is an internally threaded sleeve 12, and threadedly engaged in said sleeve is a closure cap 14 having a circumferentially extending collar 16 bearing against the outwardly flanged upper end of sleeve 12. A soft, fully annealed copper gasket 17 is interposed between the shoulder or collar 16 and the sleeve 12, and extending through said shoulder and the flange of the sleeve is a staking pin 20. Integral with and projecting upwardly from collar 16 is an eyelet 18 for attachment of a lowering cable, not shown.

Permanently closing the tank at its lower end is a bottom plate 22 welded to the side wall of the tank, and fixedly secured to the lower end of the tank, in face-to-face contact with the bottom plate, is a flat, circular upper jaw plate 24 having depending, concentric, marginal retaining flanges 26, 28 defining in the upper jaw plate a downwardly opening, continuous, circumferentially extending retaining groove for a pair of weights to be described hereinafter. The upper jaw plate is fixedly connected to the side wall of tank 10 by means of a circumferential series of bolts 30 or the like.

Welded in a center opening of the upper jaw plate 24 (Figures 1 and 9) is a depending stub or lug 31. A tubular main shaft 32 receives the plug at the upper end of the main shaft, and is welded thereto by rosette welds 33.

Slidably mounted on the main shaft 32 is a combined lower jaw plate and latching assembly generally designated 34. This asesmbly at its upper end includes a flat, circular lower jaw plate 36 having upwardly projecting, concentric flanges 38, 40 defining therebetween a lower retaining groove 41 confronting the upper retaining groove defined between the flanges 26, 28.

A plurality of weights 42 is carried by the device, said

weights being engaged in the retaining grooves when the device is being lowered to the bottom, but being releasable in a manner to be made presently apparent. In the illustrated example, two weights are shown, but the number can be increased as desired. The weights are spaced circumferentially of and between the respective jaw plates, and can be cast of concrete or the like. In the illustrated example, the weights have enlargements 43 at their inner ends, said enlargements being adapted to engage in the retaining grooves of the jaw plates. The enlargements are connected by a reduced neck 44 to a head 46 which is substantially greater in diameter than the enlargements 42, thus causing the weights to be overbalanced at their outer ends whenever they are released by the jaw plate.

Centrally formed in the heads 46 are recesses in which are fixedly engaged internally threaded tubular elements 48, adapted to facilitate attachment of the weights to the apparatus. Through the provision of the tubular fittings 48, the weights can also be connected to retrieving lines, not shown, so that following release, they need not be lost, and can be individually pulled back to the surface if desired. This of course, is at the option of the user, and the weights obviously can be so low in cost, individually, as to be adapted for a single use only without making advisable the retrieving the same.

Surrounding the main shaft 32, and normally held under compression between the jaw plates, is a compression, coil spring 50. The bottom convolution of spring 50 is engaged in a lower spring retainer 52 of annular shape, bolted to the lower jaw plate, with the top convolution of the spring being engaged in a similar spring retainer secured to the underside of the upper jaw plate 24.

The lower jaw plate and latching assembly 34 includes, in addition to the lower jaw plate, a lower jaw plate support sleeve 53. This, as shown in Figure 3, is welded at its upper end in a center opening of the lower jaw plate and as shown in Figure 1, the sleeve 53 extends downwardly a substantial distance from the lower jaw plate, with the main shaft 32 sliding in the sleeve.

Formed upon the lower end of the sleeve is an outwardly directed circumferential flange 54, comprising a lower stop shoulder for an impact plate 56, which is slidable upon the lower end portion of the sleeve. The impact plate is reinforced by angularly spaced, radially extending bracing ribs 60, extending from the periphery of the impact weight to a short, upwardly projecting sleeve portion 58 integral or otherwise made rigid with the impact plate.

The impact plate constitutes a component of a latch-release mechanism generally designated by the reference numeral 61, said mechanism being adapted for limited up-and-down sliding movement upon the lower jaw plate and latching assembly 34.

Also constituting a part of assembly 61 are diametrically opposed connector bars 62 (Figure 6). These are rigid at their lower ends with plate 56 and sleeve 58, and extend upwardly in spaced relation to the sleeve 53 of the latch asesmbly 34, in parallel relation to said sleeve. At their upper ends, connector bars 62 are made fast to diametrically opposite portions of a latch arm release ring 64 (Figures 6 and 7) surrounding a latch arm retaining collar 66 constituting a component of latch assembly 34. Minimum clearance is provided between ring 64 and collar 66. Rigidly secured to diametrically opposite portions of collar 66 are flat, approximately diamond-shaped (see Figure 1) latch arm support plates 68, welded or otherwise made rigid at their lower ends to an upper impact plate stop collar 70 spaced a short distance along sleeve 53 from the lower stop collar 54. Collars 54, 70 limit movement of the impact plate in opposite directions upon the sleeve 53.

Formed in the support plates 68 intermediate their ends are openings, receiving the ends of pivot pins or bolts 72, that extend between plate 68 at opposite sides of sleeve 53. The pins extend through latching cams 74 having circular outer configurations, said latching cams having their peripheries eccentric to the axis about which they rotate on pins 72. Integral with cams 74 and projecting upwardly therefrom are tapering latch arms 76, and these at their upper ends (Figures 6 and 7) are receivable in diametrically opposed notches 78 formed in the latch arm retaining collar 66. To properly center the latch arms between plates 68, spacer sleeves 79 are positioned upon pins 72 at opposite sides of the cams as shown in Figure 6.

In sleeve 53, as best shown in Figure 1, there are formed longitudinally extending, diametrically opposite cam slots 80, having oppositely beveled top and bottom end walls. The cams are adapted to extend into said slots in the normal, latched position of the latch arms and cams.

While the device is being readied for lowering, it is important to maintain the impact plate in engagement with the lower stop shoulder 54, so that it will not accidentally shift upwardly in Figure 6 to a position in which it releases the latch arms 76 for swinging movement out of the notches 78. Therefore, a U-shaped bracket, best shown in Figure 8, is secured to one of the plates 68, projecting outwardly therefrom and receiving one of the connector bars 62. Aligned openings are formed in the bracket 82 and bar 62, receiving a safety or locking pin 84. Immediately before the device is lowered into the water, the pin 84 is removed, so that thereafter, the latch release assembly 61 can shift upwardly relative to the latch assembly 34. There is sufficient friction between the arms 76 and the ring 64 to normally prevent the impact plate from moving upwardly when the device is being lowered into the water, but said friction is not so great as to overcome the force ultimately exerted against the bottom of the impact plate by the ocean bed, when the impact plate is to move to its latching position following extraction of a marine sample.

The main shaft 32, together with its associated upper jaw plate 24, and tank 10, constitute, together with the coring tube, an inherently buoyant main support assembly generally designated by the reference numeral 85. This assembly, as shown in Figure 9, includes, in coaxial alignment with the tubular shaft 32, a cylindrical connecting block 86 of solid formation, the upper end of which has a reduced, axial extension 88 extending into the lower end of the shaft 32 and fixedly secured to the shaft 32 by rosette welds 89. Block 86, intermediate its ends, is formed with diametrically opposed, arcuately shaped latching recesses 87. As shown in Figure 1, the cams, in the latched position of the cams and latch arms, engage in said latching recesses, to normally lock the main support assembly 85 against movement relative to the lower jaw plate and latching assembly 34.

A reduced axial extension 88 is also formed at the lower end of block 86, welded within the upper end of an elongated connecting tube 90. At the lower end of connecting tube 90, a plug 92 is provided, having a reduced extension 94 welded in said lower end of the tube 90. Plug 92 also has a depending axial extension 96 of reduced diameter, extending into the upper end of the coring tube 98. Internally formed in the upper end portion of the coring tube are angularly spaced thread segments 100, and correspondingly angularly spaced about the extension 96 are thread segments 102. This provides for quick connection or disconnection of the coring tube from the plug 92. This is desirable because, when the device is removed from the water, the coring tube should be swiftly disconnected for extraction of the sample therefrom.

Immediately below the thread segments 100, the coring tube is formed with a circumferential series of ports 104, permitting the escape of water when the earth sample moves into the coring tube.

At its lower end, the coring tube is normally closed by a piston or plug 106, and when the device is being prepared for lowering, the piston 106 is anchored in the lower end portion of the coring tube by means of readily shear-

able wires 108 extending through openings formed in the coring tube and engaging to a limited extent in diametrically opposite recesses of the piston. Below the piston, the coring tube is beveled as at 109, to facilitate its penetration of the ocean bed.

It is desired that the shaft 32 and connector tube 90 be completely filled, and remain filled, with liquid such as high octane gasoline, to reinforce the same against collapse while at the same time imparting the characteristic of buoyancy thereto. Said gasoline is sealed permanently in the shaft 32 and the connector tube 90, and formed in these two components are bleed holes 110, 112 respectively, which are normally plugged, but which can be unplugged for the purpose of extracting the gasoline, or refilling the shaft 32 and connector tube 90.

It is appropriate, before proceeding to a discussion of the operation of the device, to summarize the main component assemblies or mechanisms. The device can be summarized as including, first, an inherently buoyant main support assembly 85 which includes at its upper end the tank 10. This assembly also includes the upper jaw plate 24 and the elongated, stem-like structure shown in Figures 1 and 9, composed of the shaft 32, block 86, connector tube 90, and coring tube 98. These parts together constitute a rigid assembly.

Second, the device includes a combined lower jaw plate and latching assembly generally designated 34. This assembly is adapted to slide on the stem-like portion of assembly 85, but is normally held against said sliding movement due to the engagement of its cams 74 in the latching recess 87 of said stem-like portion. Assembly 34 includes the lower jaw plate 36, the sleeve 53 receiving the stem-like portion of assembly 85, the impact plate stops 54, 70, the latch support plate 68, the latch arms 76 and their associated cams 74, and the latch arm retaining collar 66. All the parts of the assembly 34 are made fast to one another, with the exception of the latch arms and cams, which pivot upon the plates 68.

Third, the device includes a latch arm release assembly 61. This includes the impact plate 56, which has limited sliding movement upon the lower jaw plate and latch assembly 34. Assembly 61, in fact, is bodily movable with the impact plate upon assembly 34. Assembly 61 includes in addition to the impact plate the connector bars 62 and the latch arm release 64.

The device further includes the spring 50, which is adapted to bias the jaw plates away from one another. Further included in the device are the weights 42, which are released responsive to expansion of the spring and movement of the jaw plates away from each other.

Considering now the operation of the device, initially the parts appear as in Figure 1. The weights are tightly clamped between the jaw plates, the spring 50 is heavily compressed, the cams 74 are engaged in the latching recesses to hold the assemblies 34, 85 against relative movement, and the latch arms are lockably engaged in the notches 78 by the ring 64, which fits upon the upper ends of the inwardly swung latch arms. The impact plate is against the lower stop 54 and the piston 106 is in place.

Now, the device is lowered to the ocean bottom. As the lower extremity of the coring tube 98 contacts the bottom, the earth of the bed exerts a force against the underside of the piston 106. This force shears the retaining wires 108. The coring tube, due to the weight of the device, continues to penetrate the ocean bed, so that the earth moves upwardly within the coring tube to fill the same. Thus, the sample is secured.

Since the entire mass of the apparatus is still descending, the ocean bottom eventually comes into contact with the underside of the impact plate 56. The impact plate is thus caused to move upwardly upon the sleeve 53 of assembly 34. Since the ring 74 has a rigid connection through the medium of the bars 62 to the plate 56, the ring 64 moves upwardly off the upper ends of the latch arms 76.

This frees the arms for movement out of the notches 78.

The spring 50 is now free to expand, and exerts a pressure against the lower jaw plate 36, tending to move the same downwardly in Figure 1. The beveled upper ends of the slots 80 now exert a cam action against the cams 74, tending to rotate the cams in directions to swing the arms 76 outwardly from their normal, latching position shown in Figure 1. This causes the cams to rotate to positions in which they will move completely out of the latching recesses 87 of the main support assembly 85.

Therefore, spring 50 is now fully free to expand, to force the jaw plates away from each other, that is, the spring moves the main support assembly upwardly relative to the combination lower jaw plate and latching assembly 34.

As a result, the weights 42 are now freed, and will drop from the structure due to the overbalancing of the weights at their outer ends.

The loss of the weights imparts to the device an overall characteristic of buoyancy, sufficient to cause the same to move of its own accord to the surface. In this connection, it is to be noted that the impact plate 56 is at this point bearing against the ocean bottom. Therefore, when the spring expands, its forces the impact plate (due to the fact that the impact plate is at this point bearing against the shoulder 70 provided upon assembly 34) against the ocean bottom. Simultaneously, the spring is forcing the main support assembly 85 upwardly, so that the stem-like portion of said assembly 85 is shifted upwardly within the impact plate, to ultimately extract the coring tube from the ocean bottom. Eventually, the coring tube is wholly free of the ocean bottom, and since the device is now buoyant, it will travel of its own accord to the surface, with the earth sample that has previously filled the coring tube.

It is belived apparent that the invention is not necessarily confined to the specific use or uses thereof described above, since it may be utilized for any purpose to which it may be suited. Nor is the invention to be necessarily limited to the specific construction illustrated and described, said construction only being intended to be illustrative of the principles of operation and the means for carrying out said principles, it being considered that the invention comprehends any minor change in construction that may be permitted within the scope of the appended claims.

What is claimed is:

1. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including a coring tube; a latch assembly sliding on the main support assembly and normally latched to the main support assembly to hold the assemblies against relative slidable movement; weight means confined between the latchingly engaged assemblies and arranged for release responsive to disengagement of the assemblies and relative slidable movement thereof in one direction; resilient, yielding means interposed between the assemblies and tensioned to bias the same in the weight-releasing direction on disengagement of the assemblies from each other; and releasing means sliding on the latch assembly and freeing the assemblies for disengagement from each other responsive to an upward pressure exerted on said releasing means by the ocean bottom.

2. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including an upper jaw plate and a coring tube projecting downwardly from said jaw plate; a latch assembly sliding on the main support assembly and normally latched to the main support assembly to hold the assemblies against relative slidable movement, the latch assembly including a lower jaw plate in confronting relation to the upper jaw plate; weight means confined between the jaw plates and arranged for release responsive to disengagement of the assemblies and relative slidable movement thereon in one direction; resilient, yielding means inter-

posed between the assemblies and tensioned to bias the same in the weight-releasing direction on disengagement of the assemblies from each other; and releasing means sliding on the latch assembly and freeing the assemblies for disengagement from each other responsive to an upward pressure exerted on said releasing means by the ocean bottom.

3. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including an upper jaw plate, a shaft rigid with and extending downwardly from the upper jaw plate, and a coring tube having a rigid connection to and extending downwardly from the shaft in coaxial alignment therewith; a latch assembly slidably mounted on the shaft and normally latched to the shaft to hold the assemblies against relative slidable movement, the latch assembly including a lower jaw plate in confronting relation to the upper jaw plate; weight means confined between the jaw plates and arranged for release responsive to disengagement of the assemblies and relative slidable movement thereon in one direction; resilient, yielding means interposed between the assemblies and tensioned to bias the same in the weight-releasing direction on disengagement of the assemblies from each other; and releasing means sliding on the latch assembly and freeing the assemblies for disengagement from each other responsive to an upward pressure exerted on said releasing means by the ocean bottom.

4. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including an upper jaw plate, a shaft rigid with and extending downwardly from said plate, and a coring tube having a rigid connection to and extending downwardly from the shaft in coaxial alignment therewith; a latch assembly slidably mounted upon and normally latched to the shaft to hold the assemblies against relative slidable movement, the latch assembly including a lower jaw plate in confronting relation to the upper jaw plate; weight means clampably engaged between the jaw plates and arranged for release responsive to disengagement of the assemblies and relative slidable movement of the jaw plates away from each other; resiliently compressible means surrounding the shaft and abutting at its ends against the respective jaw plates, said resiliently compressible means expanding on disengagement of the assemblies from each other, to bias the jaw plates out of clamping engagement with the weight means; and releasing means sliding on the latch assembly and freeing the assemblies for disengagement from each other responsive to an upward pressure exerted upon said releasing means by the ocean bottom.

5. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including an upper jaw plate, a shaft rigid with and extending downwardly from said plate, and a coring tube having a rigid connection to and extending downwardly from the shaft in coaxial alignment therewith; a latch assembly slidably mounted upon and normally latched to the shaft to hold the assemblies against relative slidable movement, the latch assembly including a lower jaw plate in confronting relation to the upper jaw plate; weight means clampably engaged between the jaw plates and arranged for release responsive to disengagement of the assemblies and relative slidable movement of the jaw plates away from each other; resiliently compressible means surrounding the shaft and abutting at its ends against the respective jaw plates, said resiliently compressible means expanding on disengagement of the assemblies from each other, to bias the jaw plates out of clamping engagement with the weight means; an impact plate sliding on the latch assemblies; and latch release means secured to the impact plate in position to free said assemblies for disengagement from each other, responsive to an upward pressure exerted on the impact plate by the ocean bottom tending to slidably shift the impact plate and latch release means upon the latch assembly.

6. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including an upper jaw plate, a shaft rigid with and extending downwardly from said plate, and a coring tube having a rigid connection to and extending downwardly from the shaft in coaxial alignment therewith; a latch assembly slidably mounted upon and normally latched to the shaft to hold the assemblies against relative slidable movement, the latch assembly including a lower jaw plate in confronting relation to the upper jaw plate, a sleeve rigid with and depending from the lower jaw plate, said sleeve slidably receiving the shaft, and latch arms pivotally carried by the sleeve and latchingly engaging said shaft; weight means clampably engaged between the jaw plates and arranged for release responsive to disengagement of the latch arms from the shaft and relative movement of the jaw plates away from each other; resiliently compressible means surrounding the shaft and abutting at its ends against the respective jaw plates, said resiliently compressible means expanding on disengagement of the assemblies to bias the jaw plates out of clamping engagement with the weight means; an impact plate sliding on the sleeve; and latch release means secured to the impact plate in position to engage the latch arms, said latch release means shifting out of engagement with the latch arms responsive to an upward pressure exerted on the impact plate by the ocean bottom, tending to slidably shift the impact plate and latch release means upon the sleeve.

7. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including an upper jaw plate, a shaft rigid with and extending downwardly from said plate, and a coring tube having a rigid connection to and extending downwardly from the shaft in coaxial alignment therewith; a latch assembly slidably mounted upon and normally latched to the shaft to hold the assemblies against relative slidable movement, the latch assembly including a lower jaw plate in confronting relation to the upper jaw plate, a sleeve rigid with and depending from the lower jaw plate, said sleeve slidably receiving the shaft, and latch arms pivotally carried by the sleeve and latchingly engaging said shaft; weight means clampably engaged between the jaw plates and arranged for release responsive to disengagement of the latch arms from the shaft and relative movement of the jaw plates away from each other; resiliently compressible means surrounding the shaft and abutting at its ends against the respective jaw plates, said resiliently compressible means expanding on disengagement of the assemblies to bias the jaw plates out of clamping engagement with the weight means; an impact plate sliding on the sleeve; upwardly projecting connecting bars secured to the impact plate to slide therewith upon the sleeve; and a latch release ring secured to the upper ends of said connecting bars, said latch release ring, in one position to which the impact plate is shifted, embracing the latch release arms to hold the same in shaft-engaging position, said latch release ring being adapted to move out of engagement with the latch arms responsive to movement of the impact plate upwardly upon the sleeve caused by an upward pressure exerted on the impact plate by the ocean bottom, whereby to free the latch assembly for slidable movement relative to the main support assembly to permit expansion of said resiliently compressible means.

8. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including an upper jaw plate, a shaft rigid with and extending downwardly from said plate, and a coring tube having a rigid connection to and extending downwardly from the shaft in coaxial alignment therewith; a latch assembly slidably mounted upon and normally latched to the shaft to hold the assemblies against relative slidable movement, the latch assembly including a lower

jaw plate in confronting relation to the upper jaw plate, a sleeve rigid with and depending from the lower jaw plate, said sleeve slidably receiving the shaft, and latch arms pivotally carried by the sleeve and latchingly engaging said shaft; weight means clampably engaged between the jaw plates and arranged for release responsive to disengagement of the latch arms from the shaft and relative movement of the jaw plates away from each other; resiliently compressible means surrounding the shaft and abutting at its ends against the respective jaw plates, said resiliently compressible means expanding on disengagement of the assemblies to bias the jaw plates out of clamping engagement with the weight means; an impact plate sliding on the sleeve; upwardly projecting connecting bars secured to the impact plate to slide therewithupon the sleeve; a latch release ring secured to the upper ends of said connecting bars, said latch release ring, in one position to which the impact plate is shifted, embracing the latch release arms to hold the same in shaft-engaging position, said latch release ring being adapted to move out of engagement with the latch arms responsive to movement of the impact plate upwardly upon the sleeve caused by an upward pressure exerted on the impact plate by the ocean bottom, whereby to free the latch assembly for slidable movement relative to the main support assembly to permit expansion of said resiliently compressible means; and a pair of impact-plate-engaging stops on said sleeve limiting slidable movement of the impact plate upon the sleeve in opposite directions.

9. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including an upper jaw plate, a shaft-rigid with and extending downwardly from said plate, and a coring tube having a rigid connection to and extending downwardly from the shaft in coaxial alignment therewith; a latch assembly slidably mounted upon and normally latched to the shaft to hold the assemblies against relative slidable movement, the latch assembly including a lower jaw plate in confronting relation to the upper jaw plate, a sleeve rigid with and depending from the lower jaw plate, said sleeve slidably receiving the shaft, and latch arms pivotally carried by the sleeve and latchingly engaging said shaft; weight means clampably engaged between the jaw plates and arranged for release responsive to disengagement of the latch arms from the shaft and relative movement of the jaw plates away from each other; resiliently compressible means surrounding the shaft and abutting at its ends against the respective jaw plates, said resiliently compressible means expanding on disengagement of the assemblies to bias the jaw plates out of clamping engagement with the weight means; an impact plate sliding on the sleeve; upwardly projecting connecting bars secured to the impact plate to slide therewith upon the sleeve; and a latch release ring secured to the upper ends of said connecting bars, said latch release ring, in one position, to which the impact plate is shifted, embracing the latch release arms to hold the same in shaft-engaging position, said latch release ring being adapted to move out of engagement with the latch arms responsive to movement of the impact plate upwardly upon the sleeve caused by an upward pressure exerted on the impact plate by the ocean bottom, whereby to free the latch assembly for slidable movement relative to the main support assembly to permit expansion of said resiliently compressible means, said latch arms including cams eccentric to the pivot axes of the arms, said sleeve having cam surfaces adapted to bias said cams in a direction to swing the arms outwardly from the sleeve on disengagement of the arms from the latch release ring, the shaft being formed with latching recesses in which said cams are engaged in the inwardly swung, latching positions of the latch arms.

10. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including a coring tube; a latch assembly sliding on the main support assembly and normally latched to the main support assembly to hold the assemblies against relative slidable movement; weight means confined between the latchingly engaged assemblies and arranged for release responsive to disengagement of the assemblies and relative slidable movement thereof in one direction; resilient, yielding means interposed between the assemblies and tensioned to bias the same in the weight-releasing direction on disengagement of the assemblies from each other; releasing means sliding on the latch assembly and freeing the assemblies for disengagement from each other responsive to an upward pressure exerted on said releasing means by the ocean bottom; a piston floatingly mounted within the coring tube for movement axially of and within the coring tube on penetration of the ocean bottom by the coring tube; and shearable means normally holding the piston against said axial movement, said shearable means being adapted to shear on pressure of the ocean bottom against the piston.

11. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including a coring tube; a latch assembly sliding on the main support assembly and normally latched to the main support assembly to hold the assemblies against relative slidable movement; weight means confined between the latchingly engaged assemblies and arranged for release responsive to disengagement of the assemblies and relative slidable movement thereof in one direction; resilient, yielding means interposed between the assemblies and tensioned to bias the same in the weight-releasing direction on disengagement of the assemblies from each other; and releasing means sliding on the latch assembly and freeing the assemblies for disengagement from each other responsive to an upward pressure exerted on said releasing means by the ocean bottom, the weight means comprising a plurality of weights, said weights having portions clampably engaged between the main support assembly and the latch assembly, the weights including second portions projecting outwardly from the respective assemblies and overbalancing the first named portions of the weights, whereby to effect gravitation of the weights out of position between the respective assemblies, on release of the weights.

12. A device for obtaining marine geological sample cores, comprising: a buoyant main support assembly including a coring tube, said assembly further including a tank at the upper end of the assembly, said tank being adapted to hold a quantity of a liquid lighter than water to impart buoyant characteristics to the main support assembly while simultaneously reinforcing the same against collapse under excessive water pressures; a latch assembly sliding on the main support assembly and normally latched to the main support assembly to hold the assemblies against relative slidable movement; weight means confined between the latchingly engaged assemblies and arranged for release responsive to disengagement of the assemblies and relative slidable movement thereof in one direction; resilient, yielding means interposed between the assemblies and tensioned to bias the same in the weight-releasing direction on disengagement of the assemblies from each other; and releasing means sliding on the latch assembly and freeing the assemblies for disengagement from each other responsive to an upward pressure exerted on said releasing means by the ocean bottom.

References Cited in the file of this patent

UNITED STATES PATENTS

2,488,486	Worzel	Nov. 15, 1949
2,650,068	Rand	Aug. 25, 1953
2,650,069	Rand	Aug. 25, 1953

FOREIGN PATENTS

470,808	Italy	Apr. 26, 1952