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(54) **SUBSEA OIL COLLECTOR**

UNTERWASSERÖLSAMMLER

COLLECTEUR DE PETROLE SOUS-MARIN

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Description

[0001] This nonprovisional application is based on prior provisional applications, U.S. Serial No. 60/436,119 filed on December 23, 2002, and U.S. Serial No. 60/444,028 filed on January 31, 2003.

BACKGROUND OF THE INVENTION

I. Field of the Invention

[0002] The present invention relates generally to devices and methods used to contain leaks of oil and other liquids having a specific gravity less than that of water from vessels or other fluid-containing structures below the surface of the ocean or any other body of water.

II. Background and Prior Art

[0003] It is well known that oil tankers, barges, and other oil-containing vessels occasionally sustain damage and release the contents of their cargo into the surrounding water. The cargo is typically oil, although other combustible fuels having a specific gravity less than water, such as gasoline, diesel, and kerosene, are often transported in this manner. Because the most common cargo is oil, however, that term will be used exclusively herein with the understanding that it is representative of all fluids having specific gravities less than 1.0. Such leaks sometimes occur when the vessel is still afloat, and in other cases, the vessel sinks to the bottom of the ocean and remains permanently. In those instances when a vessel sinks, the oil may still be contained within the vessel, but may slowly leak out through the damaged hull or other opening. By virtue of its lower density, the oil will rise to the surface of the water. This accumulation of oil, sometimes referred to as an "oil slick", is particularly difficult to collect, prompting tremendous efforts over the last several decades to devise equipment and methods to remove the oil from the surface.

[0004] Consequently, there is a great need for a system which can be employed to retrieve oil leaking from sunken vessels in a manner which prevents the oil from reaching the surface. Even if the oil-containing vessel is not leaking, the gradual effects of corrosion and ocean currents over the course of time will eventually cause the oil to escape from the vessel. Therefore, it is desirable to have an oil collection system which can also be positioned above a release hole formed into the penetrated hull of the vessel to remove the oil.

[0005] The document FR 2 804 935, which is considered to be the closest prior art, discloses a method and a device of this kind.

SUMMARY OF THE INVENTION

[0006] Therefore, one object of the present invention is to provide a subsea oil collector which collects oil from

below the surface of the water.

[0007] It is also an object of the present invention to provide a subsea oil collector which can be positioned on the hull of a vessel at a select location.

[0008] A further object of the present invention is to provide a subsea oil collector which can be retrieved onto surface vessels or emptied in accordance with acceptable methods.

[0009] Another object of the present invention is to provide a subsea oil collector which can be guided into place by a remotely operated vehicle (ROV).

[0010] Accordingly, a subsea fluid collector is provided, comprising a container having a fluid inlet and a fluid outlet; a vessel positioning device operatively connected to the container; a closure mechanism to close the fluid inlet; and a closure mechanism to close the fluid outlet; wherein the container is positioned by the vessel positioning device to receive, through the fluid inlet, a leaking fluid (such as crude oil, gasoline, diesel, or the like) exiting from a fluid leak source on the vessel, and wherein water, if any, residing within the container is displaced as leaking fluid enters the container. Preferably, the vessel positioning device includes means for attaching to and detaching from the vessel, and is optionally controlled remotely.

Also, it is preferable that both the inlet aclosure mechanism and outlet closure mechanism are controlled remotely, or by the volume of fluid collected within the container. In a preferred embodiment, the container has negative buoyancy prior to being filled with the leaked fluid.

[0011] In an alternate embodiment, the collector further includes a buoy residing at or near the surface of the water; and a guide cable having a first end operatively attached to the buoy, and a second end operatively attached at or near the fluid leak source; and wherein the container is slidably attached to the guide cable for ascent and descent. Optionally, a speed control means for controlling the speed at which the container slides along the cable is also present. In a further arrangement, the collector further includes a fluid conduit operatively connected between the fluid outlet on the container and the buoy, wherein the conduit permits transfer of fluid from the container to the buoy.

[0012] In another alternate embodiment, the collector further includes a ballast chain and handling wire wherein the container is attached to ballast chain which is in turn attached to a lighter, high tensile, handling wire. The chain provides negative buoyancy to assist the container on its descent. Once the container reaches the ocean bottom, and the ballast chain lays on the ocean bottom, the container can be more easily maneuvered by an ROV with the assistance of the handling wire. The handling wire can be retrieved onto a reel type mechanism to assist the collector with a controlled ascent after it has been filled with fluids.

[0013] A method for collecting fluids below the sea is also disclosed, comprising the steps of providing a fluid collection container having a positioning mechanism, a fluid inlet, and a fluid outlet; mounting the container using

the positioning device to a submerged vessel having a fluid leak source and positioning the fluid inlet above the leak source; permitting the leaking fluid to enter the container until the container is filled with fluid; closing the fluid inlet; and moving the container to the sea surface where it can be retrieved onto a surface vessel or the fluids can be transferred to a surface vessel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Figure 1 is an elevation view of a preferred embodiment of the present invention, depicting the subsea oil collector in an operating configuration.

Figure 2 is another view of the embodiment of Figure 1 offloading the contents of the collector to a barge. Figure 3 is an elevation view of an alternative embodiment of the present invention depicting the subsea oil collector in an operating configuration, while offloading fluids into a barge at the ocean surface, and attached to a guide cable extending between a submerged vessel and a surface ship.

Figure 4 is an elevation view of a third embodiment of the present invention depicting the subsea oil collector as including a ballast chain and handling wire device.

Figure 5 is yet another embodiment employing features common to those in Figures 1-4.

Figure 6 is another view of the embodiment of Figure 3 depicting the subsea oil collector in an operating configuration near the ocean bottom, while collecting fluids from the leaking source.

Figure 7 is an elevation view of an alternative embodiment depicting the subsea oil collector attached to a guide cable extending between a submerged vessel and a buoy.

Figure 8 is an elevation view of a basic alternative embodiment depicting the subsea oil collector in an operating configuration without the attachment of any cables or wires.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Unless otherwise noted herein, all construction materials are fluid impervious, and all attachments between such components are structurally sound. Materials and methods are intended to impart a maximum level of strength and structural rigidity, while keeping the invention as lightweight and easy to use as possible. Certain features which are used in assembling or operating the invention, but which are known to those of ordinary skill in the art and not bearing upon points of novelty, such as screws, bolts, nuts, welds, and other common fasteners, may not be shown for clarity.

[0016] In preparation for use of the invention to be described below, a large release hole 11 is cut into one of

the tanks on the submerged tanker or other vessel 10 using an ROV (in deep water) or by divers (at depths enabling diver operations). Immediately after the release hole 11 is formed, a closure mechanism is immediately installed on the vessel 10, such as a magnetic cap, valve, or other suitable device capable of substantially sealing the release hole 11, to prevent the premature release of fluids 12 through hole 11.

[0017] Turning now to the figures, a preferred embodiment of a subsea oil collector 1 is illustrated in an elevation view in Figure 1. The collector 1 is shown in an operating configuration below the surface of the sea 6, and includes a container 2, which can be either a rigid structure or of flexible material, having a fluid inlet 3 and a fluid outlet 4. The holding volume of the container 2 may be approximately 100,000 gallons, although this size may vary depending on the circumstances. The container 2 includes a positioning device 5, which can simply be one or more link chains, cables or a mechanical latching device, which operates to position the container 2 above a vessel 10 which has a leak source 11. Fluid 12 leaking from the leak source 11 is typically oil, gasoline or some other hydrocarbon-based fluid which has a positive buoyancy, e.g. a specific gravity less than that of the surrounding water. In the absence of the present invention, such fluid 12 would simply float to the surface 6 and form a "slick," which is exceedingly difficult and expensive to contain and remove. Preferably, the collector 1 has a "negative" buoyancy upon entering the water, such that its weight and density will enable it to sink toward the vessel 10 relatively unassisted.

[0018] In the embodiment of Figure 1, the container 2 is suspended from a tethered cable 40 which is attached to the top of container 2 and originating from some other structure, typically a ship, barge, or other first surface vessel 41, located on the sea surface 6. Most conveniently, the cable 40 is attached to a cable storage reel 42 on the first surface vessel 41, such that unwinding of the reel 42 permits the container 2 to sink toward the submerged vessel 10, and winding of the reel 42 raises the container 2 for further handling.

[0019] With specific reference to the container 2, inlet 3 may include a closure device or valve 7 which seals the container 2 at that location when closed, and which permits fluid 12 to enter container 2 when open. In typical applications, inlet 3 may range from 24 inches to 36 inches in diameter to accommodate the flow of fluids 12 released from hole 11, although the specific size may vary depending upon the precise needs of the situation. Similarly, outlet 4 also includes a closure device or valve 8 which remains closed as the container 2 is filled with fluid 12, but which can be opened to release the contents of the container 2 when it is retrieved. Both of closure devices 7, 8 may be opened and closed manually by divers or by an ROV, depending upon the depth of the water. Alternatively, either or both of closure devices 7, 8 can be opened or closed responsive to operating conditions or a fill condition of the container 2. For example, inlet

closure device 7 may be caused to close by a motor or other common solenoid device upon an electronic signal generated from buoyancy sensors indicating that the container 2 is becoming completely filled with fluid 12.

[0020] Once the container 2 is positioned directly above the hole 11 or other leak source, the positioning device 5 is preferably attached to the vessel 10. This task would be performed either by divers at the site or by an ROV depending on the depth. The outlet closure device 8 is closed to seal outlet 4, and fluid 12 rises into the inlet 3 and displaces any water, if any, residing within the container 2. As the volume of fluid 12 increases within the container 2, water is continuously expelled through the inlet 3 until the container 2 is completely filled with fluid 12. Since the density of the oil is less than the density of the water, the oil will float to the top of container 2 while displacing the water to the bottom of container 2 and then out through inlet 3. When the container 2 is filled with fluid 12, the inlet 3 is closed. Next, the positioning device 5 is detached from the vessel 10 in preparation for retrieval of the fluid-filled container 2.

[0021] Preferably, the materials of construction of the container 2 and the positioning device 5 are such that the filled container 2 will ascend without assistance due to its increased buoyancy. If desired, additional flotation devices, such as buoyant materials commonly used for deep water marine applications, may also be installed onto the container 2.

[0022] With respect to the attachment and detachment of the positioning device 5, the positioning device 5 may also comprise mechanical devices or additional ropes or cables with anchors to ensure that the collector 1 is securely in place over the release hole 11. Alternatively, the positioning device 5 may be detached in response to some other condition, such as by the closing of inlet closure device 7 or by reaching a predetermined volume of fluid 12 within container 2. In either case, it is essential that the anchoring or attachment of the positioning device 5 be sufficiently secure to prevent the premature ascendance of the container 2 due to the increased buoyancy during collection of the fluid 12.

[0023] Although not required, the container 2 may be constructed from a tightly woven scrim that is permeable by water but not by the leaking fluid, e.g. crude oil. In this configuration, water can simply be passed through the sides of the container 2 as fluid 12 fills the container 2. Preferably, the top of the container 2 may be formed in the shape of an inverted cone, because the buoyancy forces applied to the top of the container 2 when filled will impart significant stresses to the fabricated container 2. Constructing the top of the container 2 in this manner should serve to minimize such stress and avoid possible tearing.

[0024] Figure 2 illustrates a preferred manner in which the contents of the collector 1 are offloaded. Upon closure of the inlet closure device 7 and release of the positioning devices 5 from the vessel 10, a magnetic cover or other closure for the release hole 11 is reapplied as explained

earlier. Since the container 2 is filled with oil, it should then naturally rise due to its positive buoyancy. As the container 2 approaches the surface 6, an ROV or divers maneuver the container 2 toward the underside of a barge 43 or other containment vessel. The barge 43 includes an underside inlet 44 which is sized and shaped to interface with the outlet 4 of container 2. Once the outlet 4 is connected to the barge inlet 44, positioning devices 45 in the form of chains, cables, or other suitable means, are used to secure the container 2 to the barge 43. Next, outlet closure device 8 is opened to allow the buoyant fluid 12 to enter the barge 43. Generally, the buoyancy of the fluid 12 will be sufficient to convey the contents of container 2 directly into barge 43, although assisted emptying of container 2 may be accomplished by pumps or vacuum methods known to those of ordinary skill in this field. Finally, when the container 2 is substantially empty, the outlet 4 is closed, and the positioning devices 45 are released, causing the empty collector 1, due to its negative buoyancy, to sink back down toward the vessel 10 for another collection cycle. It should also be noted that although a second surface vessel in the form of barge 43 is described in this embodiment, it is also possible for the first surface vessel 41 to serve as the offloading location if it includes suitable storage compartments similar to those of barge 43.

[0025] In Figures 3 and 6, an alternative embodiment of the invention is shown, and further includes a barge 43 or other containment vessel residing at or near the surface 6 of the water and a guide cable 21. The guide cable 21 includes a first end 22 operatively attached to the barge 43, and a second end 23 operatively attached in close proximity to the fluid leak source, such as to a mechanical fastener which has been installed in or near the release hole 11. Alternatively, the second end 23 can be attached to anchors adjacent to the release hole 11. In this embodiment, the second end 23 of the guide cable 21 is attached either by divers or by an ROV depending upon the depth. The guide cable 21 serves as a guide for the container 2, and is passed through a guide tube 24 extending within the center of the container 2, thus making the container 2 slidably attached to the guide cable 21. Optionally, the guide tube 24 may be attached to the outside of the container 2 with substantially the same effect. Also, while it is believed that a single guide cable 21 may be sufficient for most purposes, two or more such guide cables 21 may be employed to maintain the orientation of the container 2. Thus, as container 2 is introduced into the water and descends toward the vessel 10, it is guided and positioned above the release hole 11 with minimal assistance. Optionally, the collector 1 may include speed control means for controlling the speed at which the container 2 slides along the guide cable 21 during descent to the vessel 10. For example, one such speed control means may comprise a friction-type lock which slows the rate of descent, but which also locks against the guide cable 21 once the container 2 reaches the vessel 10. In this manner, the speed control device

contributes to the secure placement of the container 2 and prevents its premature ascendance. Once the container 2 is properly in place, the positioning devices 5 are applied and the closure device or cover for the release hole 11 is opened by divers or by ROV, and the fluid 12 commences to fill the container 2, as shown in Figure 6. When the container 2 is filled, the inlet 3 is closed as with the previous embodiment, and the closure device over the release hole 11 is replaced. Next, the locking mechanism is released by the divers or ROV, along with the positioning devices 5, and the container 2 should rise due to its positive buoyancy. Offloading of the container 2 is essentially identical to the procedure described for the previous embodiment, except for the ease with which the container 2 may be guided toward the barge 43 by the guide cable 21.

[0026] Figure 4 illustrates a third embodiment of the present invention, depicting a variation on the first embodiment described above. Although the prior embodiments may be employed at a variety of depths, this embodiment is particularly suited to extreme depths, i.e. greater than about 5,000 feet. Specifically, the tethered cable 51 originates from a reel 42 similar to that described earlier, and it is attached at its opposite end 53 to the terminal end 54 of a ballast chain 55 or other suitably heavy and flexible device which can be used as will be explained below. Preferably, the cable 51 is constructed from a light, high tensile strength material whose weight at extreme depths will not significantly hinder the maneuverability of the container 2, and which can be easily spooled and unspooled for frequent collection cycles over extended periods of time. In this embodiment, assuming that the ballast chain 55 is attached to the top of the container 2, the ballast chain 55 is at least as long as the height and width of the container 2, such that a portion of the ballast chain 55 may come to rest upon the surrounding surfaces. For example, as the container 2 comes into contact with the vessel 10, the ballast chain 55 continues to sink and rest upon the surrounding surfaces or the ocean bottom. This effectively temporarily anchors the container 2 at the vessel 10, but still permits the ROV to move the container 2 from side to side with much less power required than without the presence of the ballast chain 55.

[0027] Figure 5 is another embodiment which depicts an elongated container 2 slidably attached to a guide cable 21, but which also includes a ballast chain 55 connected to a handling wire or cable 51 as described earlier. In this embodiment, the guide cable 21 would be attached between the vessel 10 and the offloading barge 43, which the handling wire 51 originates from a reel 42 either on the same barge 43 or on another support vessel 41. Note that in this embodiment, the ballast chain 55 is attached roughly midway along the container 2, such that the only length requirement of the ballast chain 55 is that there be at least some portion of its length that will rest upon the surrounding surfaces when the container 2 is secured to the leaking vessel 10.

[0028] Figure 7 illustrates another embodiment of the invention in which the container 2, as described previously herein with respect to Figures 3 and 6, is slidably attached to a cable having a first end 22 attached to a buoy floating at or near the surface of the water. Optionally, the buoy may comprise a floating fluid vessel, and an additional conduit fluidically connected between the top of container 2 and the buoy or floating fluid vessel. In this manner, fluids collected within container 2 may rise through the conduit and into the floating fluid vessel, which can then be removed or emptied as described earlier herein.

[0029] Finally, Figure 8 depicts the simplest embodiment in which the container 2 is maneuvered to its submerged position and retrieved for removal or emptying entirely by ROV or divers. Although both of these embodiments require the greatest amount of manual handling, their relatively inexpensive costs, in terms of both labor and equipment, may make them suitable for a variety of applications, such as in shallow water.

[0030] In all of the above described embodiments, an offloading pump on board surface vessels 43 may be used to connect to the outlet 4 to pump out fluids 12 within the container 2. The fluids 12 may be pumped into towable bladders or into other barges on site. If necessary, a steam collar may be affixed to the outlet 4 to heat and facilitate offloading of highly viscous fluids 12. Also, the filled container 2 may be towed to land for offloading or transported on a vessel to port for offloading at another site.

[0031] Although exemplary embodiments of the present invention have been shown and described, many changes, modifications, and substitutions may be made by one having ordinary skill in the art without necessarily departing from the scope of the invention. For example, the invention could be adapted to capture oil that rises from naturally occurring oil seeps in the ocean floor, by modifying the mounting device as necessary to attach to sea floor structures.

Claims

1. A subsea fluid collector (1), comprising:

- (a) a container (2) having a fluid inlet (3) and a fluid outlet (4);
 - (b) a positioning device (5) connected to said container (2); and
 - (c) a surface containment vessel (43, 41);
- wherein said container (2) is suitable for:

- being positioned by said positioning device (5) to receive, through said fluid inlet (3), a leaking buoyant fluid exiting out of a fluid leak source (11) from a submerged vessel (10); and
- having said received leaking buoyant fluid

offloaded into said surface containment vessel (43, 41);

characterized in that said subsea fluid collector (1) further includes:

- (a) a ballast device (55) attachable to said container (2); and
 - (b) a cable (51) having a first end operatively attachable to said surface containment vessel (43) or to a further surface vessel, and a second end operatively attachable to said ballast device (55).
2. The subsea fluid collector (1) of claim 1, wherein said inlet (3) includes a closure mechanism (7) adapted to prevent said fluids from escaping said container (2).
 3. The subsea fluid collector (1) of claim 1, wherein said container (2) further includes an outlet closure device (8).
 4. The subsea fluid collector (1) of claim 1, wherein said container (2) has negative buoyancy.
 5. The subsea fluid collector (1) of claim 1, further including a guide cable (21) having a first end (22) operatively attached to said surface containment vessel (43), and a second end (23) operatively attached at or near said fluid leak source; and wherein said container (2) is slidably attached to said guide cable (21).
 6. The subsea fluid collector (1) of claim 5, further including locking means for attaching said container (2) to said surface containment vessel (43).
 7. The subsea fluid collector (1) of claim 5, further including speed control means for controlling the speed at which said container (2) slides along said guide cable (21).
 8. The subsea fluid collector (1) of claim 7, wherein said speed control means comprise a friction-type lock.
 9. The subsea fluid collector (1) of claim 1, wherein said collector (1) includes:
 - (a) said further surface vessel (41), which is suitable for residing at or near the surface of the water; and
 - (b) a cable (40) having a first end operatively attachable to said further surface vessel, and a second end operatively attachable to said container (2).
 10. The subsea fluid collector (1) of claim 1, further in-

cluding attachment means for securing said container (1) to said surface containment vessel during offloading of said fluids from said container (2).

- 5 11. The subsea fluid collector (1) of claim 9, wherein said further surface vessel (41) includes means (42) for reeling and unreeling said cable (40).
- 10 12. The subsea fluid collector (1) according to claim 1, wherein said surface containment vessel (43, 41) is provided with an underside inlet (44) shaped and sized to interface with said fluid outlet (4).
- 15 13. The subsea fluid collector (1) of claim 1, wherein said ballast device is a chain (55).
- 20 14. The subsea fluid collector (1) of claims 1 or 13, wherein said ballast device (55) is an heavy and flexible device at least as long as the height and the width of the container (2).
- 25 15. The subsea fluid collector (1) of claim 1, wherein said surface containment vessel is a barge (44) or a buoy.
- 30 16. The subsea fluid collector (1) according to any of the preceding claims, wherein said container (2) is constructed from a tightly woven scrim that is permeable by water but not by said leaking fluid.
- 35 17. A method of collecting fluids below the sea, comprising the steps of
 - (a) providing a fluid collection container (2) having a positioning device (5) and a fluid inlet (3);
 - (b) providing a surface containment vessel (43, 41);
 - (c) mounting said container (2) using said positioning device (5) to a submerged vessel having a fluid leak source and positioning said fluid inlet above said leak source;
 - (d) permitting said leaking fluid to enter said container until said container (2) is filled with said fluid;
 - (e) retrieving said container to a location at or near the surface of the sea for offloading fluids from said container into said surface containment vessel
- 40 **characterized in that** said method further comprises a step of providing:
 - a ballast device (55) attachable to said container (2); and
 - a cable (51) having a first end operatively attachable to said surface containment vessel (43) or to a further surface vessel, and a second end operatively attachable to said ballast device (55);
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- 50
- 55

18. The method of claim 17, further including the step of closing said inlet (3) prior to retrieving said container (2).
19. The method of claim 17, wherein said step of mounting said container (2) to said submerged vessel (10) includes removably attaching said positioning device to said submerged vessel (10). 5
20. The method of claim 18, wherein said step of retrieving said container (2) from the sea includes detaching said positioning device from said submerged vessel (10). 10
21. The method of claim 17, wherein said container (2) is slidably attached to a guide cable extending between said submerged vessel (10) and said surface containment vessel (43,41). 15
22. The method of claim 17, wherein the step of retrieving said container (2) comprises allowing said container (2) to float to the surface of the sea. 20
23. The method of claim 17, wherein said ballast device is an heavy and flexible ballast device at least as long as the height and the width of the fluid collection container (2). 25
24. The method according to claim 17, wherein said container (2) is constructed from a tightly woven scrim that is permeable by water but not by said leaking fluid. 30
25. The method according to claim 17, wherein said container comprises a fluid outlet (4) and wherein said surface containment vessel (43,41) has and underside inlet (44) shaped and sized to interface with said fluid outlet (4), said method further comprising the step of interfacing said fluid outlet (4) and said underside inlet for offloading fluids from said container (2) into said surface containment vessel (43,41). 35 40

Patentansprüche

1. Ein Unterwasserfluidkollektor (1), der folgende Merkmale umfasst:
- (a) einen Behälter (2) mit einem Fluideinlass (3) und einem Fluidauslass (4); 50
- (b) eine Positionierungsvorrichtung (5), die mit dem Behälter (2) verbunden ist; und
- (c) ein Oberflächenaufnahmegefäß (43, 41); wobei der Behälter (2) geeignet ist, um:
- durch die Positionierungsvorrichtung (5) positioniert zu werden, um durch den Fluideinlass (3) ein austretendes schwimmendes Fluid

aufzunehmen, das aus einer Fluidaustrittsquelle (11) aus einem untergetauchten Gefäß (10) herauskommt; und das aufgenommene austretende schwimmende Fluid in das Oberflächenaufnahmegefäß (43, 41) zu entladen;

dadurch gekennzeichnet, dass der Unterwasserfluidkollektor (1) folgende Merkmale umfasst:

- (a) eine Ballastvorrichtung (55), die an dem Behälter (2) befestigt werden kann; und
- (b) ein Kabel (51), das ein erstes Ende aufweist, das wirksam an dem Oberflächenaufnahmegefäß (43) oder einem weiteren Oberflächengefäß befestigt werden kann, und einem zweiten Ende, das wirksam an der Ballastvorrichtung (55) befestigt werden kann.

2. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, bei dem der Einlass (3) einen Schließmechanismus (7) umfasst, der angepasst ist, um zu verhindern, dass Fluide aus dem Behälter (2) entweichen.
3. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, bei dem der Behälter (2) ferner eine Auslassschließeinrichtung (8) umfasst. 25
4. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, bei dem der Behälter (2) einen negativen Auftrieb aufweist. 30
5. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, der ferner ein Führungskabel (21) umfasst, das ein erstes Ende (22) aufweist, das wirksam an dem Oberflächenaufnahmegefäß (43) befestigt ist, und ein zweites Ende (23), das wirksam an oder nahe der Fluidaustrittsquelle befestigt ist; und wobei der Behälter (2) gleitbar an dem Führungskabel (21) befestigt ist. 35 40
6. Der Unterwasserfluidkollektor (1) gemäß Anspruch 5, der ferner eine Verriegelungseinrichtung zum Befestigen des Behälters (2) an dem Oberflächenaufnahmegefäß (43) umfasst. 45
7. Der Unterwasserfluidkollektor (1) gemäß Anspruch 5, der ferner eine Geschwindigkeitssteuereinrichtung zum Steuern der Geschwindigkeit umfasst, mit der der Behälter (2) entlang dem Führungskabel (21) gleitet.
8. Der Unterwasserfluidkollektor (1) gemäß Anspruch 7, bei dem die Geschwindigkeitssteuereinrichtung ein Reibungstyp-Verriegelung umfasst. 55
9. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, bei dem der Kollektor (1) folgende Merkmale um-

fasst:

- (a) das weitere Oberflächengefäß (41), das geeignet ist, um an oder nahe der Wasseroberfläche zu sein; und 5
- (b) ein Kabel (40) mit einem ersten Ende, das wirksam an dem weiteren Oberflächengefäß befestigt werden kann, und einem zweiten Ende, das wirksam an dem Behälter (2) befestigt werden kann. 10
- 10. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, der ferner eine Befestigungseinrichtung zum Befestigen des Behälters (1) an dem Oberflächenaufnahmegefäß während des Entladens der Fluide von dem Behälter (2) umfasst. 15
- 11. Der Unterwasserfluidkollektor (1) gemäß Anspruch 9, bei dem das weitere Oberflächengefäß (41) eine Einrichtung (42) zum Aufwickeln und Abwickeln des Kabels (40) umfasst. 20
- 12. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, bei dem das Oberflächenaufnahmegefäß (43, 41) mit einem Unterseiteneinlass (44) versehen ist, der geformt und abgemessen ist, um mit dem Fluidauslass (4) eine Grenzfläche zu bilden. 25
- 13. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, bei dem die Ballastvorrichtung eine Kette (55) ist. 30
- 14. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1 oder 13, bei dem die Ballastvorrichtung (55) eine schwere und flexible Vorrichtung ist, die zumindest so lange ist wie die Höhe und die Breite des Behälters (2). 35
- 15. Der Unterwasserfluidkollektor (1) gemäß Anspruch 1, bei dem das Oberflächenaufnahmegefäß eine Barge (44) oder eine Boje ist. 40
- 16. Der Unterwasserfluidkollektor (1) gemäß einem der vorhergehenden Ansprüche, bei dem der Behälter (2) aus einem eng gewebten Gitterstoff gebildet ist, der durchlässig ist für Wasser, aber nicht für das austretende Fluid. 45
- 17. Ein Verfahren zum Sammeln von Fluiden unter dem Meer, das folgende Schritte umfasst: 50
 - (a) Bereitstellen eines Fluidsammelbehälters (2) mit einer Positionierungsvorrichtung (5) und einem Fluideinlass (3);
 - (b) Bereitstellen eines Oberflächenaufnahmegefäßes (43, 41); 55
 - (c) Befestigen des Behälters (2) unter Verwendung der Positionierungsvorrichtung (5) an einem untergetauchten Gefäß mit einer Fluidaus-

trittsquelle und Positionieren des Fluideinlasses über der Austrittsquelle;

(d) Erlauben, dass das austretende Fluid in den Behälter eindringt, bis der Behälter (2) mit dem Fluid gefüllt ist;

(e) Zurückholen des Behälters zu einer Position an oder nahe der Meeresoberfläche zum Entladen von Fluiden von dem Behälter in das Oberflächenaufnahmegefäß,

dadurch gekennzeichnet, dass das Verfahren ferner einen Schritt des Bereitstellens

- einer Ballastvorrichtung (55), die an dem Behälter (2) befestigt werden kann; und
- eines Kabels (51) mit einem ersten Ende, das wirksam an dem Oberflächenaufnahmegefäß (43) oder an einem weiteren Oberflächengefäß befestigt werden kann, und einem zweiten Ende, das wirksam an der Ballastvorrichtung (55) befestigt werden kann, umfasst.

18. Das Verfahren gemäß Anspruch 17, das ferner vor dem Zurückholen des Behälters (2) den Schritt des Schließens des Einlasses (3) umfasst.

19. Das Verfahren gemäß Anspruch 17, bei dem der Schritt des Befestigens des Behälters (2) an dem untergetauchten Gefäß (10) das entfernbare Befestigen der Positionierungsvorrichtung an dem untergetauchten Gefäß (10) umfasst.

20. Das Verfahren gemäß Anspruch 18, bei dem der Schritt des Zurückholens des Behälters (12) aus dem Meer das Lösen der Positionierungsvorrichtung von dem untergetauchten Gefäß (10) umfasst.

21. Das Verfahren gemäß Anspruch 17, bei dem der Behälter (2) gleitbar an einem Führungskabel befestigt ist, das sich zwischen dem untergetauchten Gefäß (10) und dem Oberflächenaufnahmegefäß (43, 41) erstreckt.

22. Das Verfahren gemäß Anspruch 17, bei dem der Schritt des Zurückholens des Behälters (2) das Ermöglichen umfasst, dass der Behälter (2) zu der Meeresoberfläche schwebt.

23. Verfahren gemäß Anspruch 17, bei dem die Ballastvorrichtung eine schwere und flexible Ballastvorrichtung ist, die zumindest so lang ist wie die Höhe und die Breite des Fluidsammelbehälters (2).

24. Das Verfahren gemäß Anspruch 17, bei dem der Behälter (2) aus einem eng gewebten Gitterstoff gebildet ist, der durchlässig ist für Wasser, aber nicht für das austretende Fluid.

25. Das Verfahren gemäß Anspruch 17, bei dem der Behälter einen Fluidauslass (4) umfasst und das Oberflächenaufnahmegefäß (43, 41) einen Unterseiteneinlass (44) aufweist, der geformt und abgemessen ist, um mit dem Fluidauslass (4) eine Grenzfläche zu bilden, wobei das Verfahren ferner den Schritt des Bildens einer Grenzfläche des Fluidauslasses (4) und des Unterseiteneinlasses umfasst, zum Entladen von Fluiden von dem Behälter (2) in das Oberflächenaufnahmegefäß (43, 41).

Revendications

1. Collecteur de fluide sous-marin (1) comprenant :

- (a) un réservoir (2) ayant une entrée de fluide (3) et une sortie de fluide (4) ;
 - (b) un dispositif de positionnement (5) raccordé audit réservoir (2) ; et
 - (c) une enceinte de confinement de surface (43, 41) ;
- dans lequel ledit réservoir (2) est approprié pour :

- être positionné par ledit dispositif de positionnement (5) pour recevoir, par le biais de ladite entrée de fluide (3), une fuite de fluide flottant sortant d'une source de fuite de fluide (11) provenant d'une enceinte immergée (10) ; et
- rejeter ladite fuite de fluide flottant reçu dans ladite enceinte de confinement de surface (43, 41) ;

caractérisé en ce que ledit collecteur de fluide sous-marin (1) comprend en outre :

- (a) un dispositif de lest (55) pouvant être fixé audit réservoir (2) ; et
- (b) un câble (51) ayant une première extrémité pouvant être fixée de manière opérationnelle à ladite enceinte de confinement de surface (43) ou à une autre enceinte de surface, et une deuxième extrémité pouvant être fixée de manière opérationnelle audit dispositif de lest (55).

2. Collecteur de fluide sous-marin (1) selon la revendication 1, dans lequel ladite entrée (3) comprend un mécanisme de fermeture (7) adapté pour empêcher lesdits fluides de s'échapper dudit réservoir (2).

3. Collecteur de fluide sous-marin (1) selon la revendication 1, dans lequel ledit réservoir (2) comprend en outre un dispositif de fermeture de sortie (8).

4. Collecteur de fluide sous-marin (1) selon la revendication 1, dans lequel ledit réservoir (2) a une flotta-

bilité négative.

5. Collecteur de fluide sous-marin (1) selon la revendication 1, comprenant en outre un câble de guidage (21) ayant une première extrémité (22) fixée de manière opérationnelle à ladite enceinte de confinement de surface (43) et une deuxième extrémité (23) fixée de manière opérationnelle au niveau de ou à proximité de ladite source de fuite de fluide ; et dans lequel ledit réservoir (2) est fixé de manière coulissante audit câble de guidage (21).

6. Collecteur de fluide sous-marin (1) selon la revendication 5, comprenant en outre des moyens de blocage pour fixer ledit réservoir (2) à ladite enceinte de confinement de surface (43).

7. Collecteur de fluide sous-marin (1) selon la revendication 5, comprenant en outre des moyens de contrôle de vitesse pour contrôler la vitesse à laquelle ledit réservoir (2) coulisse le long dudit câble de guidage (21).

8. Collecteur de fluide sous-marin (1) selon la revendication 7, dans lequel lesdits moyens de contrôle de vitesse comprennent un blocage de type à friction.

9. Collecteur de fluide sous-marin (1) selon la revendication 1, dans lequel ledit collecteur (1) comprend :

- (a) ladite enceinte de surface supplémentaire (41), qui est appropriée pour se trouver au niveau de ou à proximité de la surface de l'eau ; et
- (b) un câble (40) ayant une première extrémité pouvant être fixée de manière opérationnelle à ladite enceinte de surface supplémentaire et une deuxième extrémité pouvant être fixée de manière opérationnelle audit réservoir (2).

10. Collecteur de fluide sous-marin (1) selon la revendication 1, comprenant en outre des moyens de fixation pour fixer ledit réservoir (1) à ladite enceinte de confinement de surface pendant la décharge desdits fluides dudit réservoir (2).

11. Collecteur de fluide sous-marin (1) selon la revendication 9, dans lequel ladite enceinte de surface supplémentaire (41) comprend des moyens (42) pour enrouler et dérouler ledit câble (40).

12. Collecteur de fluide sous-marin (1) selon la revendication 1, dans lequel ladite enceinte de confinement de surface (43, 41) est prévue avec une entrée inférieure (44) formée et dimensionnée pour s'interfacer avec ladite sortie de fluide (4).

13. Collecteur de fluide sous-marin (1) selon la revendication 1, dans lequel ledit dispositif de lest est une

chaîne (55).

14. Collecteur de fluide sous-marin (1) selon les revendications 1 ou 13, dans lequel ledit dispositif de lest (55) est un dispositif lourd et flexible au moins aussi long que la hauteur et la largeur du réservoir (2).

15. Collecteur de fluide sous-marin (1) selon la revendication 1, dans lequel ladite enceinte de confinement de surface est une barge (44) ou une bouée.

16. Collecteur de fluide sous-marin (1) selon l'une quelconque des revendications précédentes, dans lequel ledit réservoir (2) est construit à partir d'un canevas étroitement tissé qui est perméable à l'eau mais pas à ladite fuite de fluide.

17. Procédé pour collecter des fluides sous la mer, comprenant les étapes consistant à :

(a) prévoir un réservoir de collecte de fluide (2) ayant un dispositif de positionnement (5) et une entrée de fluide (3) ;

(b) prévoir une enceinte de confinement de surface (43, 41) ;

(c) monter ledit réservoir (2) en utilisant ledit dispositif de positionnement (5) sur une enceinte immergée ayant une source de fuite de fluide et positionner ladite entrée de fluide au-dessus de ladite source de fuite ;

(d) permettre à ladite fuite de fluide d'entrer dans ledit réservoir jusqu'à ce que ledit réservoir (2) soit rempli avec ledit fluide ;

(e) récupérer ledit réservoir jusqu'à un emplacement au niveau de ou à proximité de la surface de la mer pour décharger les fluides dudit réservoir dans ladite enceinte de confinement de surface,

caractérisé en ce que ledit procédé comprend en outre une étape consistant à prévoir :

- un dispositif de lest (55) pouvant être fixé audit réservoir (2) ; et

- un câble (51) ayant une première extrémité pouvant être fixée de manière opérationnelle à ladite enceinte de confinement de surface (43) ou à une enceinte de surface supplémentaire, et une deuxième extrémité pouvant être fixée de manière opérationnelle audit dispositif de lest (55).

18. Procédé selon la revendication 17, comprenant en outre l'étape consistant à fermer ladite entrée (3) avant de récupérer ledit réservoir (2).

19. Procédé selon la revendication 17, dans lequel ladite étape consistant à monter ledit réservoir (2) sur ladite enceinte immergée (10) comprend l'étape consis-

tant à fixer de manière amovible ledit dispositif de positionnement sur ladite enceinte immergée (10).

20. Procédé selon la revendication 18, dans lequel ladite étape consistant à récupérer ledit réservoir (2) de la mer comprend l'étape consistant à détacher ledit dispositif de positionnement de ladite enceinte immergée (10).

21. Procédé selon la revendication 17, dans lequel ledit réservoir (2) est fixé de manière coulissante sur un câble de guidage s'étendant entre ladite enceinte immergée (10) et ladite enceinte de confinement de surface (43, 41).

22. Procédé selon la revendication 17, dans lequel l'étape consistant à récupérer ledit réservoir (2) comprend l'étape consistant à permettre audit réservoir (2) de flotter à la surface de la mer.

23. Procédé selon la revendication 17, dans lequel ledit dispositif de lest est un dispositif de lest lourd et flexible au moins aussi long que la hauteur et la largeur du réservoir de collecte de fluide (2).

24. Procédé selon la revendication 17, dans lequel ledit réservoir (2) est construit à partir d'un canevas étroitement tissé qui est perméable à l'eau mais pas à ladite fuite de fluide.

25. Procédé selon la revendication 17, dans lequel ledit réservoir comprend une sortie de fluide (4) et dans lequel ladite enceinte de confinement de surface (43, 41) a une entrée inférieure (44) formée et dimensionnée pour s'interfacer avec ladite sortie de fluide (4), ledit procédé comprenant en outre l'étape consistant à interfacer ladite sortie de fluide (4) et ladite entrée inférieure pour décharger les fluides dudit réservoir (2) dans ladite enceinte de confinement de surface (43, 41).

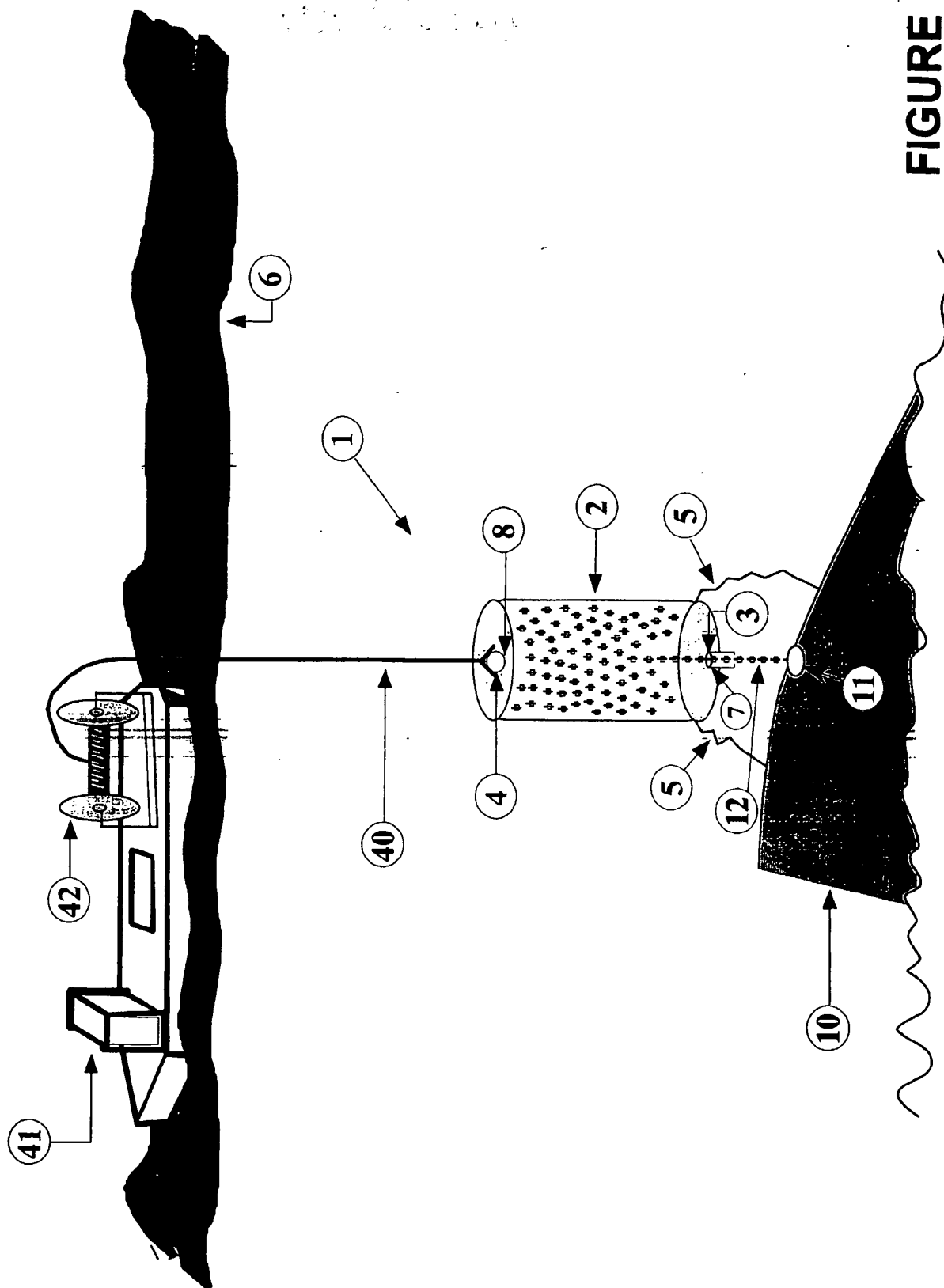


FIGURE 1

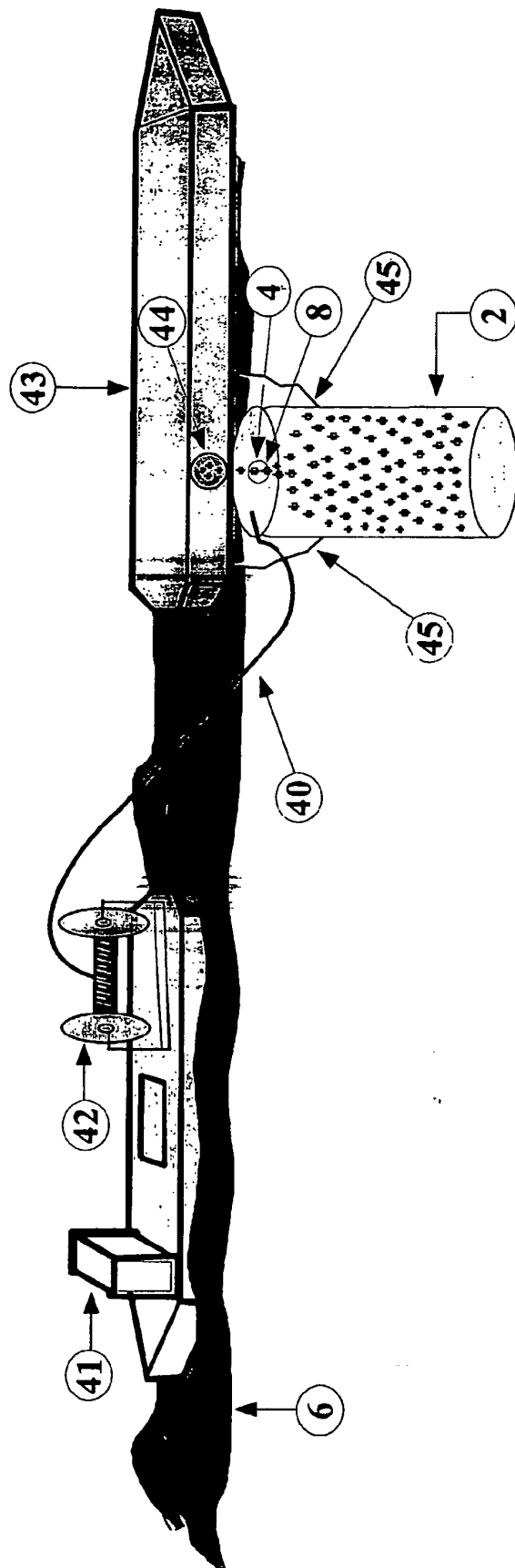


FIGURE 2

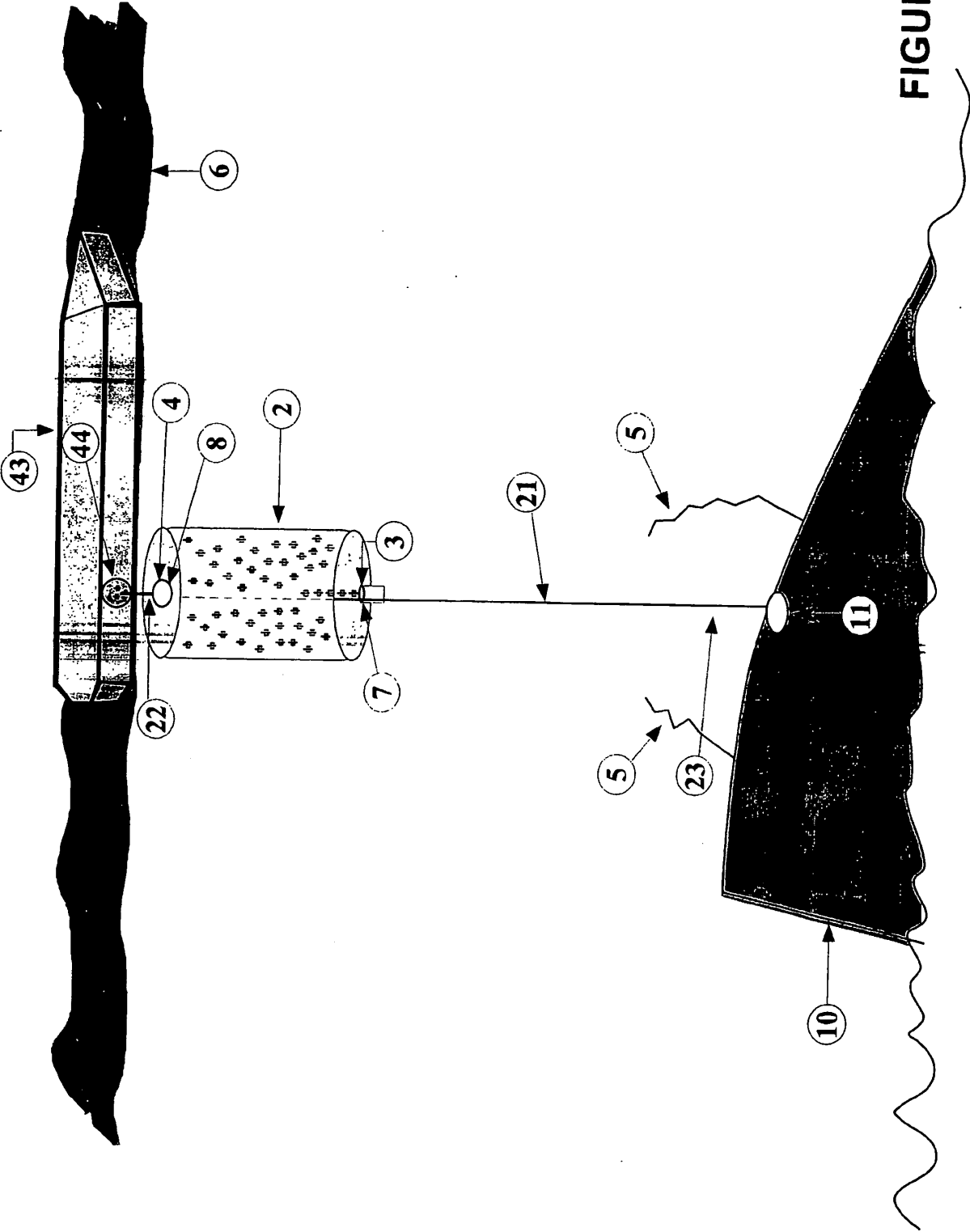


FIGURE 3

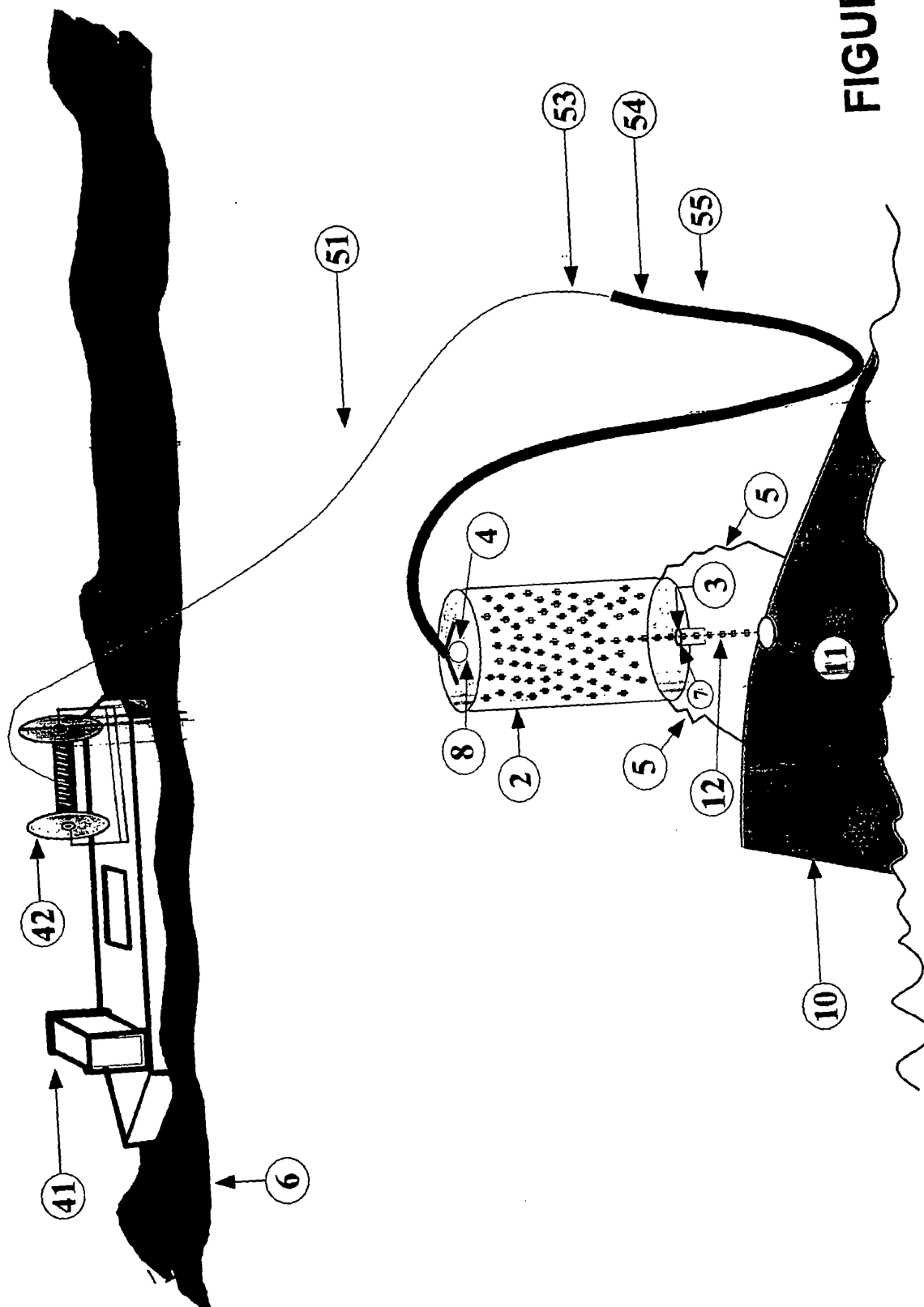


FIGURE 4

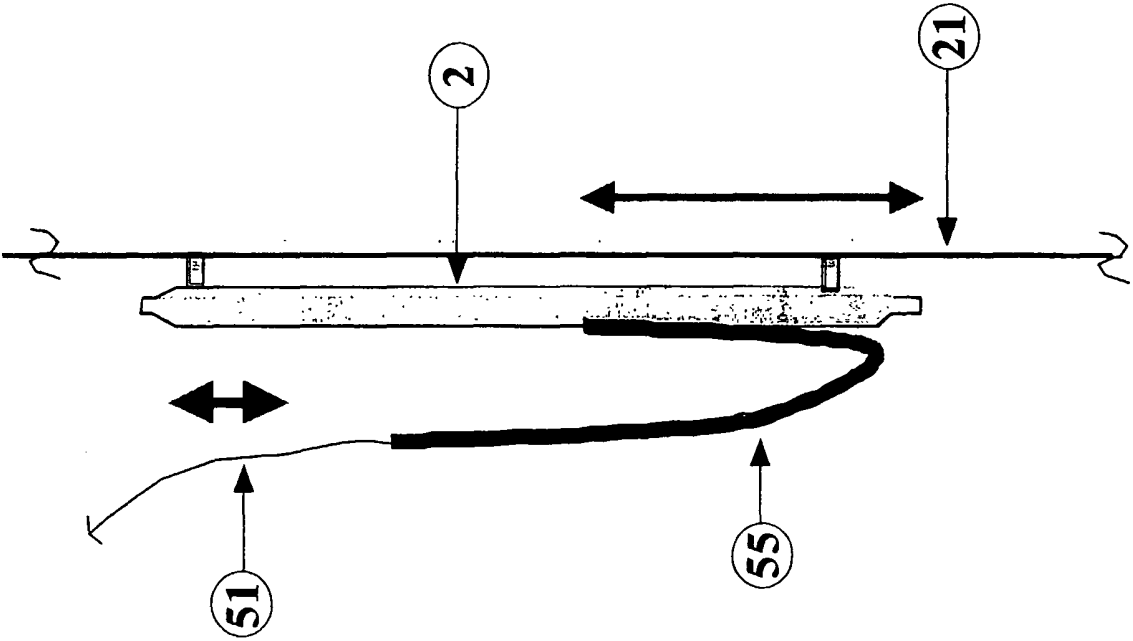


FIGURE 5

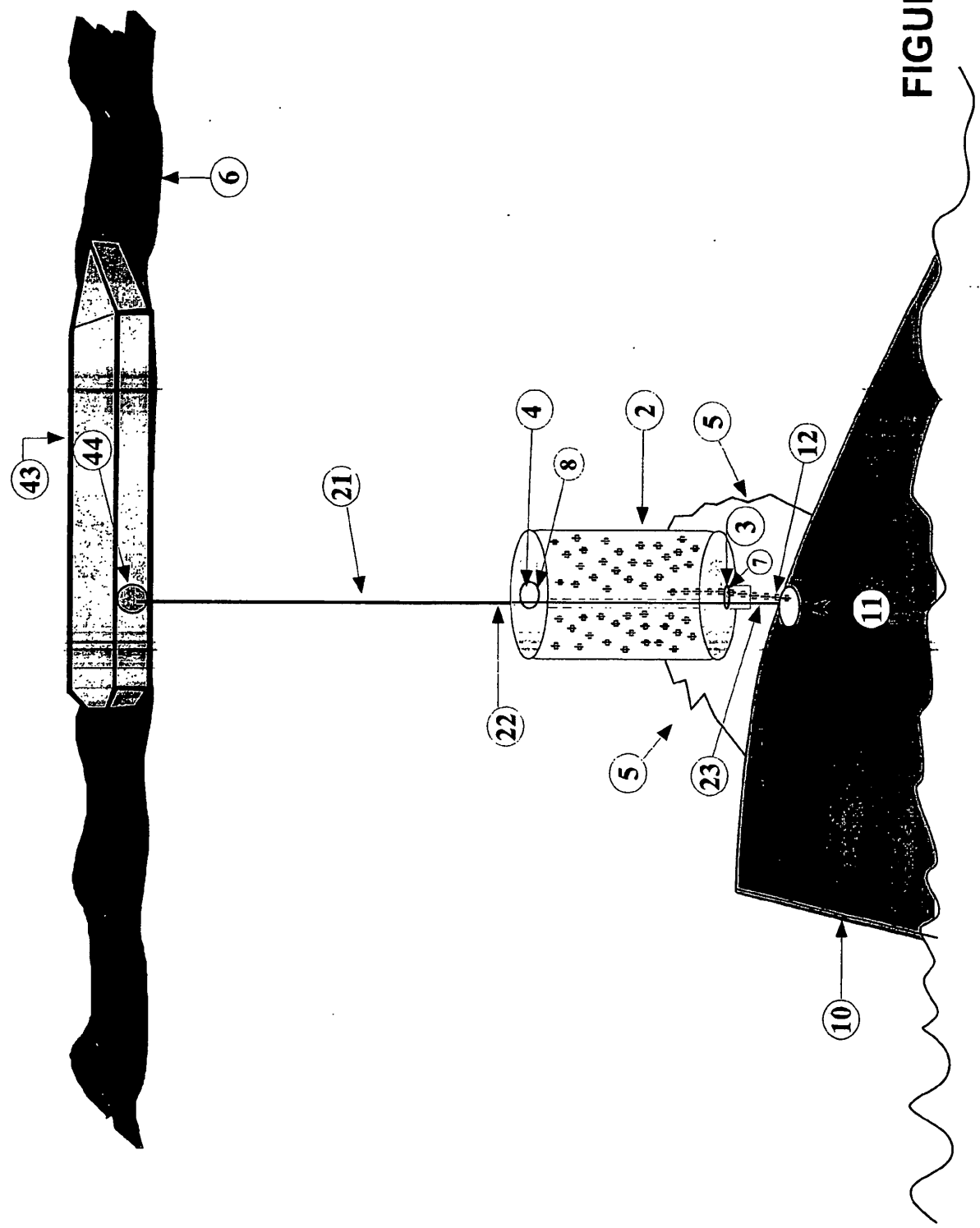
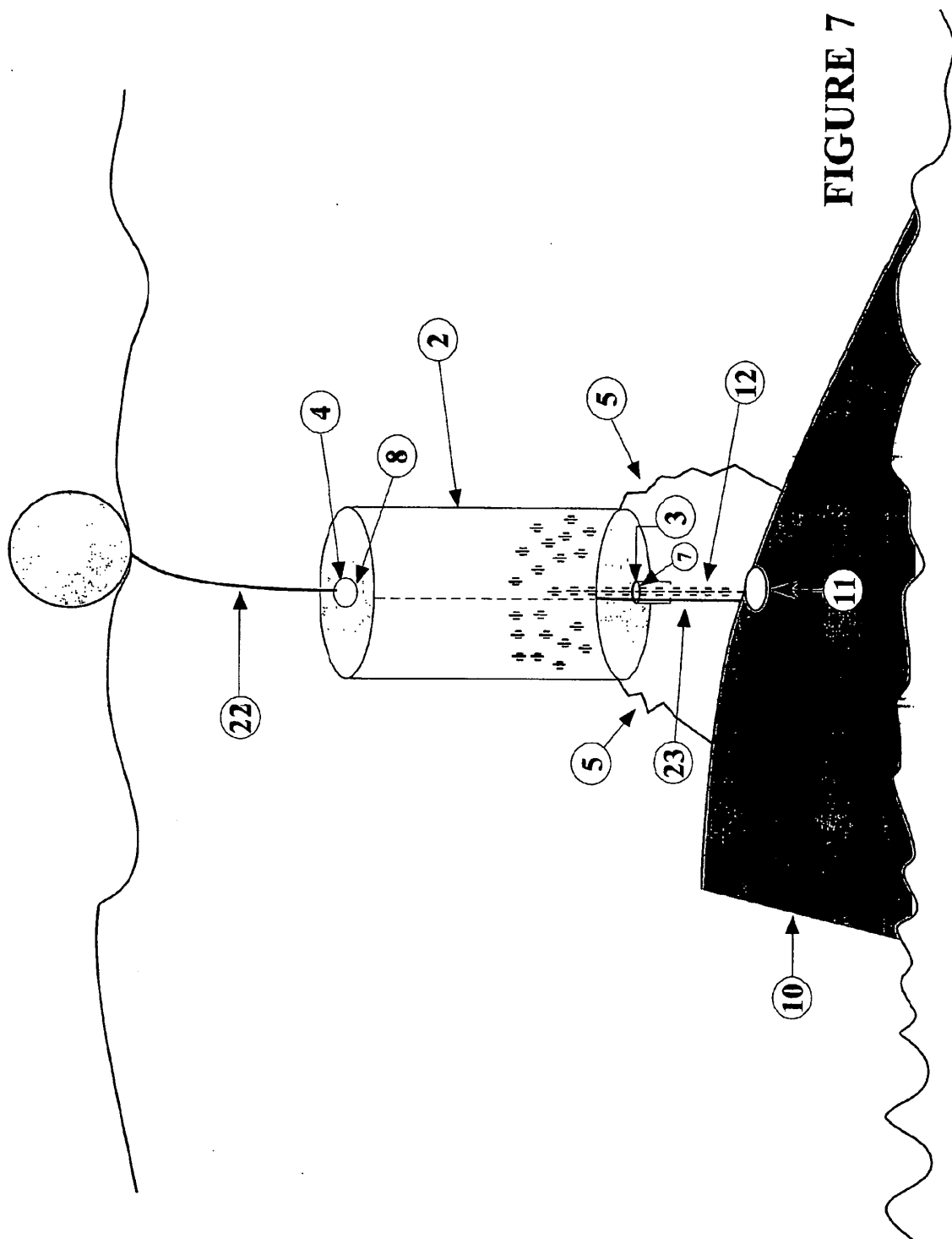


FIGURE 6



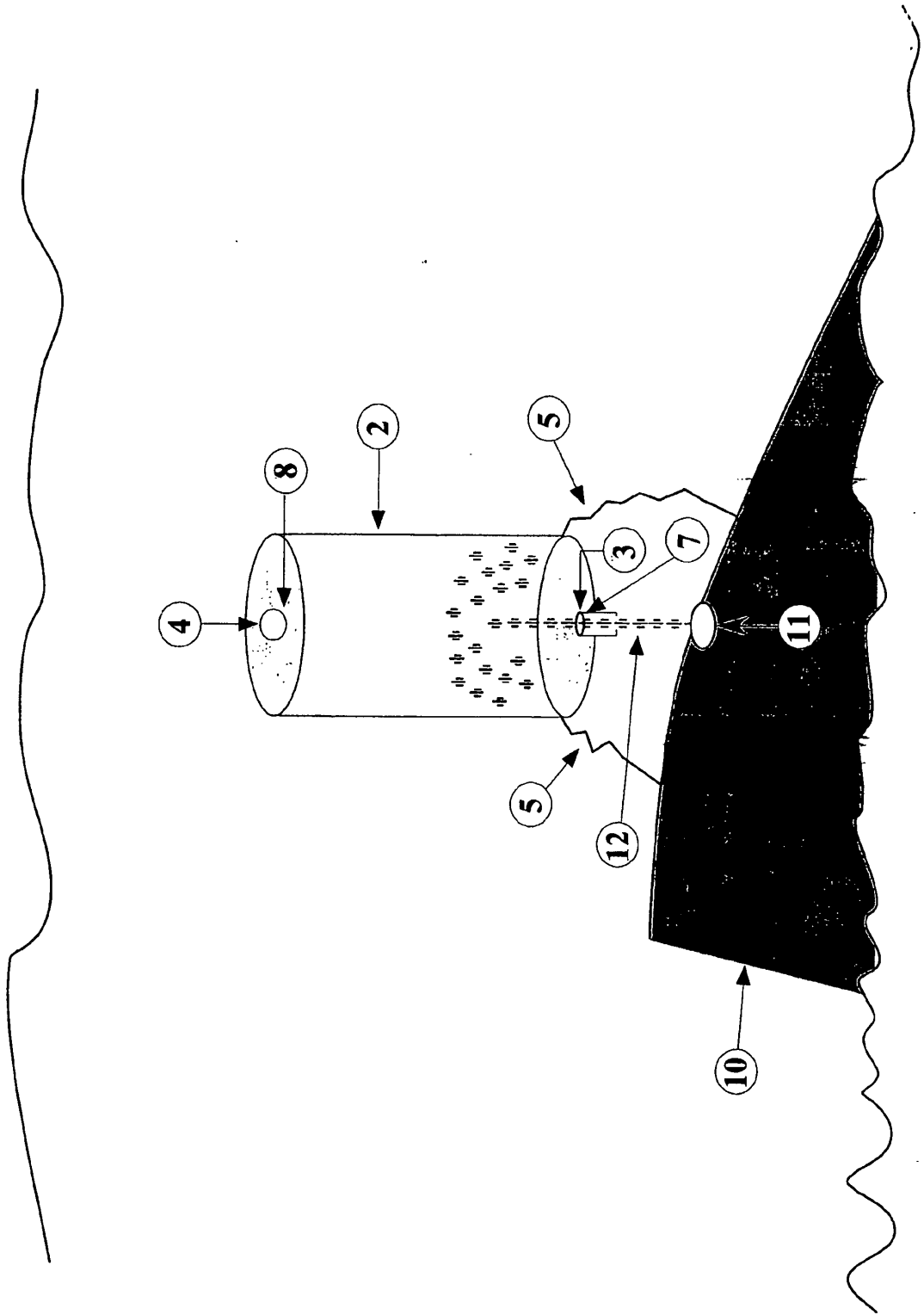


FIGURE 8

REFERENCES CITED IN THE DESCRIPTION

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