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Binkley, Jr. et al.

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[54] **SAMPLING APPARATUS FOR WASTE DISPOSAL SYSTEM**

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[51] **Int. Cl.**.....**G01n 1/12**

[58] **Field of Search**....73/421 B, 423 R, 425.4 R, 425.6

[56] **References Cited**

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[57] **ABSTRACT**

A sampling apparatus particularly for use at an offshore location. It relates in particular to a liquid specimen collector utilized in the monitoring of the quality of waste contaminated water which is being discharged at the offshore location. The apparatus includes guide means whereby a specimen or sample water collector can be lowered to a desired water depth. The water collector unit embodies a spring actuated container which is lowered from the water's surface in a closed condition such as to acquire a liquid sample when actuated to an opened position.

9 Claims, 5 Drawing Figures

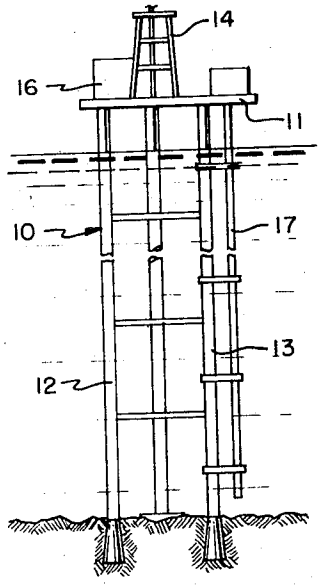


FIG. 1

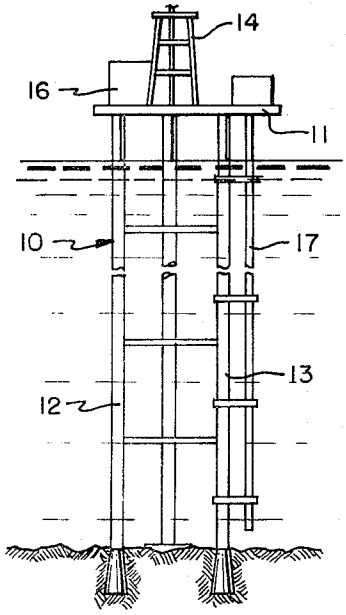


FIG. 2

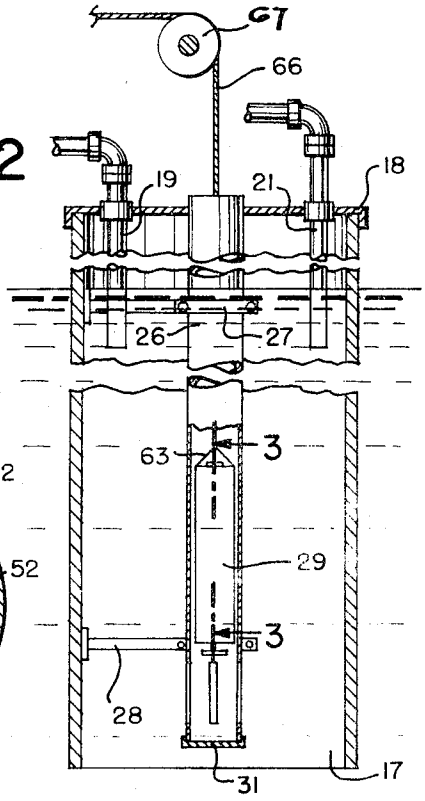


FIG. 5

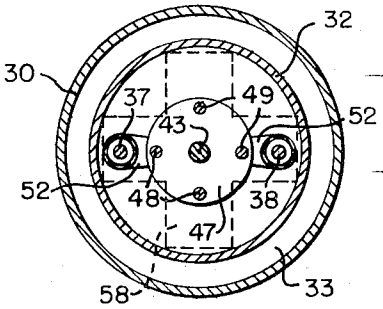


FIG. 3

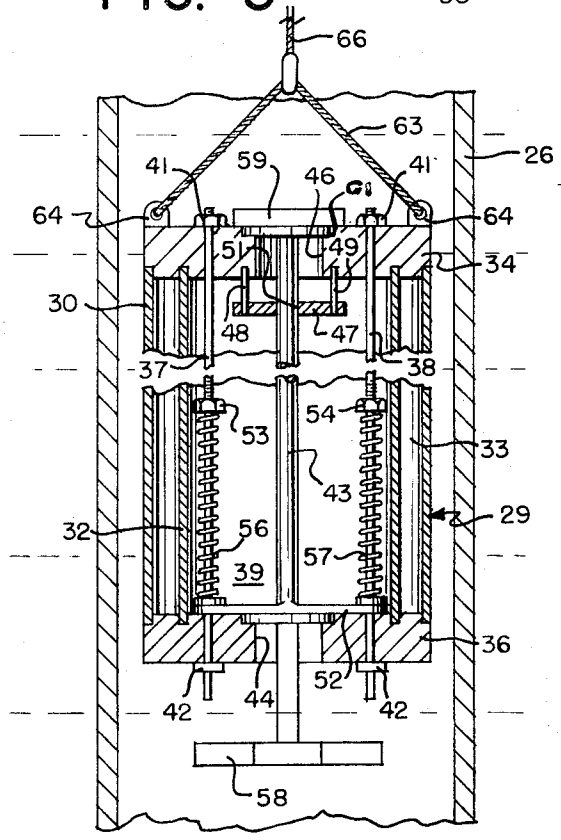
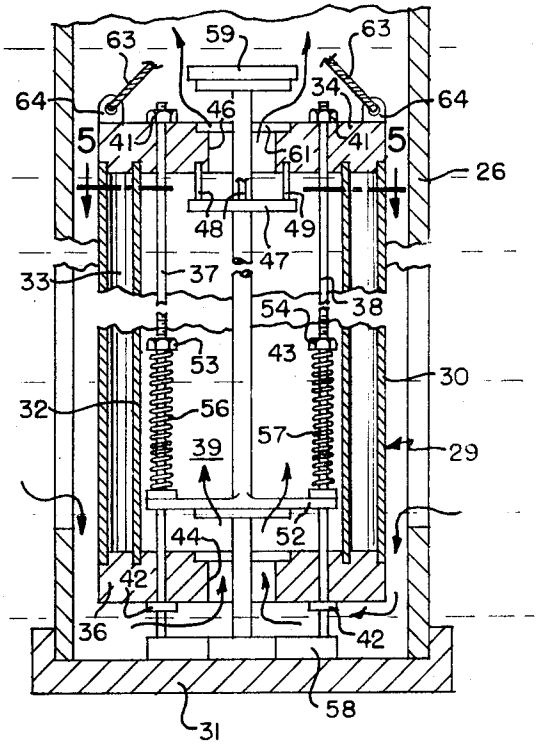


FIG. 4



72,257 (1-1)

SAMPLING APPARATUS FOR WASTE DISPOSAL SYSTEM

BACKGROUND OF THE INVENTION

In the desire of the petroleum industry to avoid the accidental or inadvertent pollution of the environment, many remedial measures have been taken particularly in the instance of offshore facilities. At such installations, normally a flow of gas and/or crude oil is collected from one or more wells, processed at the marine structure and thereafter redistributed to shore locations. To avoid the use of pipelines, tankers and other means of conveyance for carrying away waste, non-petroleum products, the latter are generally disposed of in one manner or another.

A large proportion of the discharge flow from any drilling or producing platform resides in the large amount of water and other fluids that are brought to the surface in conjunction with the flow of usable crude products. The salt water of course has no practical use and is normally separated form the of product and discharged back into the surrounding water.

As a part of the recent trend assumed to minimize the degree of pollution which enters the nation's offshore waters, the various states as well as the Federal Government have imposed rather stringent regulations concerning disposition of materials deposited from an offshore platform or structure into the surrounding waters. Of particular concern of course is the inadvertent or otherwise, discharge of petroleum based products into surrounding waters, which products tend to float on the water's surface. Such materials when found in large quantities constitute not only polluting conditions, but also create a prospectively flowable atmosphere. In response to the increasing likelihood of the inadvertent or accidental discharge of such petroleum liquids, various governments have imposed such regulations which in their severest form could require the complete elimination of petroleum products from discharged effluent.

In recognition of government regulations concerning disposal of waste products from offshore marine structures, the present invention in its simplest aspect is provided to monitor the effluent from the platform or structure. More specifically it provides a water sampling means adapted to cooperate with an effluent disposal system in order to control the possible detrimental effects of the latter.

DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. 1 is an elevation view of an offshore marine platform embodying the instant water sampling system.

FIG. 2 is an enlarged segmentary view in partial cross-section showing the sampling system.

FIG. 3 is an enlarged segmentary view in cross-section taken along line 3—3 in FIG. 2.

FIG. 4 is similar to FIG. 3, showing the water sampler in actuated condition.

FIG. 5 is a sectional view taken along line 5—5 in FIG. 4.

FIG. 1 illustrates in part an offshore platform or marine structure **10** of the type contemplated which comprises in essence a deck **11** which is supported from a plurality of upstanding, mutually braced legs **12** and **13**. The latter reach to the ocean floor and are

there anchored or piled in such manner to elevate the deck a predetermined height beyond the water's surface. Deck **11** as shown carries the normal complement of equipment peculiar to such platforms as for example a derrick **14**, draw-works **16**, storage and crew's quarters, etc.

The usual offshore marine structure as a rule accommodates a plurality of wells which are drilled from the platform and into the substratum. To provide the most efficient coverage, the wells are normally directionally drilled to radiate from the platform thereby achieving the maximum exploratory coverage for a particular field or oil producing area. In any event, in the course of producing oil from such an area, there will be intermixed with the gas pressured oil flow, a considerable amount of salt water as well as other non-petroleum products. The latter, along with the crude product flow, is urged upwardly through the well, and into the storage tanks, separating equipment or the like positioned on deck **11**.

There presently exist a number of ways whereby unusable liquids and solids after being processed on deck **11**, are directed into the surrounding water without polluting the same. Toward illustrating the instant invention, the features thereof will be described in conjunction with one such means, i.e. an effluent disposal pile. It should be understood however, that the present sampling system is not limited in function to use either with, or in conjunction with the shown disposal pile.

Referring to FIG. **2**, the marine platform or structure **10** is provided with an effluent disposal means. The latter comprises in essence an elongated closed side cylindrical caisson **17** which is fastened to the platform side at convenient, spaced apart points. The caisson or pile **17** extends downwardly to the ocean floor, the lower end thereof being open, and spaced a sufficient distance from the floor to permit free passage of water and solids from the confines of the casing lower end as said materials descend through the latter.

The upper end of caisson **17** is provided with a tight fitting closure **18** which in turn supports a plurality of conduits **19** and **21**. The latter are communicated with various sources of effluent to be discharged such as separated salt water, waste materials, and other non-petroleum products which accumulate ancillary to an oil producing or refining operation.

The respective conduits **19** and **21** are fixedly positioned within caisson **17**, extending from the upper end thereof and terminating at a point below the water's surface.

During normal operation, the respective conduits carry discrete streams of various forms of effluent which are deposited below the water's surface. Within the closed wall confines of caisson **17** there will be a natural separation of materials, those that are lighter flowing to the top, heavier matter falling to the ocean floor. In the instance of floating materials, petroleum based matter for example, the latter will accumulate at the water's surface. Periodically, the accumulation is removed from the caisson upper end and either processed on the platform deck, or transported elsewhere for disposal depending on its nature and use characteristics. The disposal process is virtually continuous since offshore platforms of the type contem-

plated are in continuous producing operation. Thus, there will ordinarily be a steady flow of water from the caisson upper end, downwardly to the lower end.

Toward monitoring the condition of waters passing downwardly through casing **17**, and to regulate the purity of the material being discharged from said casing lower end, the disposal caisson is provided with a water sampling means. As previously mentioned, the instant disposal system discloses one form of apparatus with which the instant sampling device is usable. The latter can further operate satisfactorily on a number of other systems as well as independently.

The sampling arrangement comprises a guide means **26** which is fixedly positioned within caisson **17** by brackets **27** and **28** extending from the upper end thereof to a point just above where the water is discharged into the surrounding environment at the caisson lower end. The guide means **26** as shown comprises in one form a tubular member which, in the instant arrangement, can be fabricated of Fiberglas or other nonmetallic material. The guide means as the name suggests, functions to restrain and guide a supported water specimen collector or capsule **29** which passes longitudinally therealong carrying specimens of the discharged water to the deck for analysis.

Specimen collecting capsule **29** is generally elongated, assuming a size approximately 18 inches by 3 ½ inches outside diameter. The capsule is of such a size as to be readily slidable within guide tube **26** whereby the capsule can be raised to the water's surface or dropped of its own weight through the water filled tube **26** to fall to the bottom of the latter.

Tube **26** as shown, is provided with a stop means **31** extending across the lower end thereof which is preferably a cap, similar closure, or partial closure. In one embodiment stop means **31** can constitute merely a transverse bracket extending across the casing opening.

Capsule **29** comprises an outer casing **30** of generally cylindrical configuration, and an inner shell **32** which is spaced from the casing to define a substantially uniform annulus **33** therebetween. Each extremity of the respective casing and shell is provided with end caps **34** and **36** which are fixedly positioned thereto by welding or similar fastening to form a fluid tight joint. Annulus **33** defined between the respective casing and shell walls, can be provided with a heavy ballast material. The latter can be lead or the like to afford the capsule sufficient weight to encourage its rapid progress from the guide tube upper end to the lower end in a gravity descent.

The respective end caps **34** and **36** are held in tight engagement at the corresponding ends of the casing and shell by one or more, and preferably a plurality of tie rods **37** and **38**. Said tie rods extend longitudinally of inner chamber **39** defined between the respective caps **34** and **36**, and shell **32**. The tie rods are held in place by nuts **41** and **42** or similar means to assure a water tight connection at the respective joints of said members. Rods **37** and **38** extend downwardly from the lower end cap **36**, and function as guides for the actuating rod **43** and to hold the caps **36** and **34** in position.

A central actuating rod **43** passes longitudinally through capsule **29**, supportably extending from opposed ends thereof. The lower end of said rod **43** is slidably received in a central opening **44** formed within end cap **36** to provide a substantially tight yet operable fit. The upper end of rod **43** traverses upper end cap **34** by way of central opening **46** formed in the latter; said opening normally functions as an intake or discharge passage for liquids.

A guide member **47** is carried at the lower side of upper end cap **34**, being suspended on a pair of downwardly depending pins **48** and **49** which space and support member **47** from said cap lower surface. Member **47** is provided with a central opening **51** which slidably receives rod **43** whereby to permit free yet guided reciprocal motion of the latter through said member.

A transverse valve arm **52** is carried at the lower end of rod **43**, depending laterally from said rod and having vertically oriented openings at opposed ends thereof which slidably register on the respective tie rods **37** and **38**.

An inner section of said connecting rods **37** and **38** is provided with a threaded section which receives adjusting nuts **53** and **54**. Said nuts can be rotatably positioned along the rod threaded section to alter the strain in compression springs **56** and **57** disposed about the rod and confined intermediate adjusting nut **53** and valve arm **52**.

The lower end of rod **43** is provided with a foot **58** or other engaging surface adapted to engage the closure cap **31** at the guide means **26** lower end, or the transverse bracket positioned across the latter. Thus, as capsule **29** descends, foot **58** will initially contact said closure cap **31**, thereby displacing central rod **43** upwardly as the weight of the capsule **29** continues to be directed downwardly.

The upper end of said rod **43** is provided with a circular valve seat **59** which is slidably received within upper end cap **34** to engage a circular valve seat **61** arranged concentrically with the central opening within cap **34** to form a water tight seal.

The upper end of the capsule **29** is provided with one or more connecting means **63** and **64** to engage a supporting cable **66** which in turn extends from the capsule to a position at the upper end of the guide tube **26**. The cable can thus be actuated by a wind-up mechanism or similar device **67** to raise or lower the capsule **29**. As noted, normally capsule **29** is permitted to descend through tube **26** by a gravity fall. Thereafter, and after obtaining a water sample at the lower end of the guide tube, it is raised to the water's surface.

Optionally, a second cable can be attached to the top of the circular valve seat **59**. With said cable attached, it becomes possible to open the sampler manually by tensioning the cable, which motion simultaneously raises upper valve seat **59** and lower valve arm **52**. After fluid has entered chamber **39**, the cable is allowed to go slack, thus allowing valve arm **52** and valve seat **59** to close. Said cable **66** is then used to raise the sampler unit.

Operationally, while capsule **29** is in a supported disposition between the upper and lower ends of guide tube **26**, the respective compression springs **56** and **57** will urge both the upper valve seat **59** and the lower valve arm **52** downwardly into contact with the respective corresponding valve seats. In such a position inner chamber **39** of the capsule is essentially closed. The chamber will retain air, and even perhaps leak water

thereinto as the capsule descends through the guide tube. In either instance, the pressure within the central chamber **39** will be substantially constant as the capsule descends deeper through the water due to the equal pressure exerted in opposite directions on the valves **59** and **52** which have equal areas exposed to the fluid exerting pressure.

At the lower end of guide tube **26**, where it is desired to take the water sample, lower foot **58** of the central rod **43** will engage the guide tube cap **31**. As noted, such engagement will simultaneously cause valve arm **52** to rise, thereby opening the lower inlet valve as well as simultaneously opening the upper exhaust valve. An inrushing pressurized water at the guide tube lower end fills chamber **39**, water or air contained therein will be exhausted therefrom so that what is retained is essentially the water from the guide tube lower end.

As capsule **29** is raised by support cable **66**, release of the foot **58** from the tube cap **31** will urge the central rod **43** downwardly, thus closing both the inlet and exhaust valves.

The contents of capsule **29** will of course be under a degree of pressure depending on the depth of water in which the platform is operating. For relatively extensive depths a considerable degree of pressure will be built up within capsule chamber **39**.

At the platform deck, the water sample can be readily removed from capsule **29** merely by again depressing the central rod **43** to release the respective upper and lower valves. The liquid specimen will thereby exit from the central chamber **39**. In such condition the capsule is again ready to be lowered through the guide tube to acquire additional samples of the water. The above sequence of steps can be carried out indefinitely and continuously whereby the condition of the water at the lower end of guide tube **26** is constantly monitored.

Other modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. Liquid sampler device for a marine structure positioned at an offshore body of water and including;

elongated guide means disposed uprightly in said body of water, said elongated guide means having an upper end positioned adjacent to the water's surface, and a lower end spaced downwardly from the latter,

a liquid specimen capsule having a collector chamber, said capsule being operably carried within said elongated guide means and longitudinally movable therealong between upper and lower ends thereof,

normally closed valve means in said specimen capsule communicated with said collector chamber, and being actuatable to an open position whereby to admit and retain a liquid in said chamber when said collector is lowered a desired distance into said elongated guide means,

and means for moving said specimen capsule along said guide means.

2. In a liquid sampler device as defined in claim **1** wherein; said elongated guide means comprises a rigid walled member having at least a portion of said rigid wall disposed contiguous with said liquid capsule to slidably guide the latter during movement of said capsule along said guide means.

3. In a liquid sampler device as defined in claim **1** wherein; said elongated guide means comprises a closed conduit, the walls of said conduit defining a passage for slidably guiding said capsule therethrough.

4. In a liquid sampler device as defined in claim **1** wherein; said elongated guide means comprises a rigid walled cylindrical conduit having the inner surface of said cylindrical wall disposed contiguous with said liquid capsule to slidably guide the latter along said conduit.

5. In a liquid sampler device as defined in claim **1** wherein; said elongated guide means includes actuating means disposed at the capsule lower end, said actuating means being positioned to engage said elongated guide means whereby to actuate said valve means to an open position when the capsule is lowered to said guide means lower end.

6. In a liquid sampler device as defined in claim **1** wherein; said normally closed valve means includes biasing means engaging said valve means and urging the latter into said normally closed position.

7. In a liquid sampler device as defined in claim **6** wherein; said biasing means is adjustable to vary the degree of biasing urged against said valve means.

8. In a liquid sampler device as defined in claim **6** wherein; said biasing means includes spring means carried on said capsule and being adjustable to vary the degree of closing bias exerted against said valve means.

9. In a liquid sampler device as defined in claim **6** wherein; said normally closed valve means includes a valve stem operably disposed in said collector chamber, and carrying at least one valve seat thereon adapted to engage a corresponding seat in said collector whereby to regulate said valve means, a shoe portion of said valve stem depending from the capsule lower end whereby to longitudinally displace said valve stem and adjust said valve means to the open position when said stem shoe portion engages said actuating member.

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