LIQUID SAMPLING APPARATUS FOR CONDUIT LIQUID FLOW

RELATED APPLICATIONS

Reference is made to my copending applications Ser. No. 08/421,474 filed Apr. 12, 1995, and Ser. No. 08/589,719 filed Jan. 22, 1996.

BACKGROUND OF THE INVENTION

1. Field of the invention

This invention relates generally to the art of sampling liquids for analysis and more particularly to a novel liquid sampling method and apparatus for sampling liquid within a liquid receiver, especially water within a storm drain system.

2. Discussion of the Prior Art

As will become readily evident from the ensuing description, the liquid sampling method and apparatus of this invention may be utilized for a variety of liquid sampling purposes. However, the invention intended primarily for sampling liquid flowing through a conduit which may be either an open channel or a closed pipe and more particularly for sampling water within the conduits or pipes of industrial and municipal storm drain systems in order to monitor for the presence of toxic substances and other contaminants in the water. The invention will be described primarily in this context.

Municipal storm drain systems generally discharge into large public water bodies such as lakes, rivers, and the like and, in the case of California, into the San Diego, Santa Monica, and San Francisco bays. The water in such storm drain systems often contains toxic substances and other contaminants which are carried with the water to and pollute the receiving water body. Much of this contamination is created by deliberate illegal dumping of industrial waste products and the like into the storm drain systems in order to avoid the time, costs, and problems associated with legal disposition of such waste products.

Another extensive source of such contamination is storm water runoff from industrial property. In this regard, the ground, floors, and other exterior surfaces of industrial properties are often contaminated by a variety of industrial substances due spillage during handling of the substances, leakage from equipment, storage drums, pipe lines and the like, and hosing of interior surfaces onto exterior surfaces. During a rainstorm, these substances are entrained in the storm water runoff from the properties and carried with the runoff into the local municipal storm drain systems.

Attempts have been made to reduce such storm water runoff pollution from industrial property. The state of California, for example, has passed legislation establishing a program entitled the Industrial Storm Water Permitting Program. This program requires industrial property owners to obtain a permit, called a General Industrial Storm Water Permit, for storm water runoff or discharge from their properties into their municipal storm drain systems. These permits are issued through the State Water Resources Control Board.

Unfortunately, compliance with these programs is tedious, time consuming, and costly. Obtaining a General Industrial Storm Water Permit in California, for example, involves the payment of an annual fee and the performance by each applicant, referred to as a discharger, of certain obligations. These obligations include: (a) preparing a site map of the property in question, starting with the roof of each building on the property, showing the flow path of storm water runoff from the roof to the ground, then across the ground onto the storm water drainage system on the property, and then from the property drainage system into the public storm drain system; (b) visual observation of storm water discharge from the property during both the wet season (October through April) and the dry season (May through September); (c) submission of an estimate or calculation of the storm water discharge volume during two significant storm events in the wet season; (d) submission of a proposed storm water sampling program; (e) execution of the approved storm water sampling program in compliance with the state regulations to obtain certain storm water sample; and (f) submission of the storm water samples for analysis. These storm water samples must be taken in a manner which complies with certain rigorous and complicated requirements of the Storm Water Permitting Program. As a consequence, there is a great temptation for industrial property owners to ignore or comply only partially with the local program requirements.

One important use of the liquid sampling method and apparatus of this invention involves monitoring for the presence of contaminants at various locations within a municipal storm drain system, not only to determine the presence of any contaminants in the water flowing through the systems but, more importantly, to aid in locating the source of any contamination present in the water. Another use of the invention involves sampling storm water runoff from industrial properties and the like in order to comply with the California Industrial Storm Water Permitting Program or similar programs in other states. The invention will be described in connection with these uses. As mentioned earlier, however, the invention is capable of various other liquid sampling purposes.

A variety of liquid sampling methods and devices are known in the prior art. Included in this prior art are the following: U.S. Pat. No. 3,826,144, dated Jul. 30, 1974, to Wessels; U.S. Pat. No. 3,962,973, dated Jun. 15, 1976, to Takeuchi; U.S. Pat. No. 4,279,148, dated Jul. 21, 1981, to Fitzgerald; U.S. Pat. No. 4,467,645, dated Aug. 28, 1984, to Murphree; U.S. Pat. No. 4,762,009, dated Aug. 9, 1988, to Scrudto; U.S. Pat. No. 4,958,528, dated Sep. 25, 1990 to Garrison; U.S. Pat. No. 5,069,878, dated Dec. 3, 1991, to Ehrenkranz; U.S. Pat. No. 5,156,489, dated Oct. 20, 1992, to Replogle; U.S. Pat. No. 5,186,052, dated Feb. 16, 1993, to Gray; U.S. Pat. No. 5,220,825, dated Jun. 22, 1993, to Peterson et al; U.S. Pat. No. 5,279,151, dated Jan. 18, 1994, to Coody et al; U.S. Pat. No. 5,347,877, dated Sep. 20, 1994, to Gadbois; U.S. Pat. No. 5,408,892, dated Apr. 25, 1995, to Kawanami et al; Article entitled "Development of a Self-Sealing Rain Sampler for Arid Zones" by E. Adar et al, pages 592–596, vol 16, No. 3, June 1980, of publication entitled "Water Resources Research" describing a rain sampler.

SUMMARY OF THE INVENTION

The liquid sampling apparatus of this invention comprises a sample collection device proper, hereafter referred to simply as a sampling device, and a supporting base for supporting the sampling device in a fixed sampling position. The sampling device has inlet means including a liquid inlet through which liquid may enter the sampling device and a sample collection chamber for receiving liquid entering the inlet. This inlet means of the preferred inventive embodiments described herein includes inlet valve means like that embodied in the sampling devices of the above mentioned copending applications for closing the liquid inlet except when the inlet is submerged in liquid being sampled and the sample collection chamber is not filled.