SAMPLE COLLECTOR

BACKGROUND OF THE INVENTION

This invention relates to sample collectors, such as for example, sample collectors that periodically remove a specimen of waste water or well water and deposit it in a separate container for analysis.

In one class of sample collectors, a series of samples of water are pumped into an inlet and from the inlet to an outlet. At the outlet, the samples are deposited in separate containers for later analysis.

In a prior art type of sample collector of this class, the containers are bottles and the outlet and bottles are moved with respect to each other so that samples are deposited in different bottles for later analysis. The prior art sample collectors have several disadvantages, such as: (1) it is difficult to fill the containers completely; (2) it is difficult to seal the containers thus easily contaminating the liquid with gases in the air or from other sources; (3) it is difficult to adjust the apparatus to handle different size samples; and (4) the apparatus is subject to spillage caused by failure to register the container with the outlet or to match the amount of sample with the size of the container or other bottle.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the invention to provide a novel sample collector.

It is a further object of the invention to provide a novel method for collecting samples.

It is a still further object of the invention to provide a novel sequential sampler for water.

It is a still further object of the invention to provide a novel method and apparatus for sealing samples of liquid to reduce contamination.

In accordance with the above and further objects of the invention, a computer periodically causes a packaging assembly to form an open package. In coordination therewith, a pump assembly begins to pump a sample so that the open container is in position and sealed at the bottom by the time the fluid flows from the outlet into the container inlet. The packaging assembly then seals the container relatively tightly and permits it to fall a short distance as a sealed package containing one or more samples. Preferably, the web material is printed with: (1) an identification number; (2) a sequence number; (3) time of sample; (4) reason for sample initiation (e.g. time setting, external trigger, etc); and (5) volume of sample; as the package is being formed in a manner known in the art.

In one embodiment, the package is formed of continuous web material. In other embodiments, they are formed of tubular web material in the packaging assembly or are separately formed in one packaging machine and utilized in another that fills them with samples, such as through a large diameter needle introduced temporarily into the package through a septum. The packages may be cut after they are sealed into separate packages before the next package is sealed or may be formed as a continuous series of separated compartments that are interconnected by web material. Each package or compartment may contain one sample drawn at one time or a plurality of samples drawn at different times.

In use, the samples are moved with printed identification on them to a source of analysis. At that source, analysis is performed using the printed information on the package. For example, the printed information may indicate the source of the samples, the volume of sample in the package, the cause of the initiation of taking a sample, such as for example, was it at periodic time settings or externally triggered or manually triggered or the like.

In one mode of analysis, at the laboratory receiving the packages, a determination is made of the tests that are to be performed and the volume needed for each test. A configuration of tests may then be made up which utilizes the volume most efficiently by dividing the volume needed for each test into the total volume of the package. In this way, maximum benefit can be obtained from the given volume as indicated on the package.

The time the sample is taken also provides useful information. For example, in some industrial uses, tests are performed for toxic contaminants such as chromium or arsenic in a plating facility. The detection of such a contaminant and the time at which it occurs enables the testor to analyze the source of leakage of the contaminant into the fluid supply.

The sample initiation may indicate when a substance has been released into the system. This is more likely to be significant in an open channel sewerage system or the like where it is necessary to determine who has released a certain material for cost assessment purposes or the like. Thus, a change in the flow rate of the system or the level of the liquid as detected by a detector, may indicate the time during which the material is released into the system and thus provide an indication that a sample should be taken or a larger than usual sample should be taken.

As can be understood from the above description, the fluid sampler of this invention has several advantages, such as: (1) it can form a large number of packages; (2) data is conveniently printed right on the package as it is formed; (3) the size of the package can be automatically tailored to the size of the sample to avoid air that may contaminate the liquid therein; (4) the sample is immediately sealed in the package and thus reduces contamination; and (5) overflow can easily be avoided.

SUMMARY OF THE DRAWINGS

The above noted and other features of the invention will be better understood from the following detailed description when considered with reference to the accompanying drawings, in which:

FIG. **1** is a fragmentary, elevational view, partly exploded, of the sampler which is an embodiment of the invention;

FIG. **2** is a sectional view illustrating a flow-through-chamber that is part of the embodiment of FIG. **1**;

FIG. **3** is a fragmentary, elevational view, partly broken away and partly exploded, of an embodiment of an outlet for samples useful in the embodiment of FIG. **1**;

FIG. **4** is a fragmentary, perspective view of a web processing system that is part of the embodiment of FIG. **1**;

FIG. **5** is a schematic sketch of the web travel path of the embodiment of FIG. **4**;

FIG. **6** is a schematic control diagram of the operation of the embodiment of FIG. **4**;

FIG. **7** is an exploded perspective drawing of a sealing device used in the embodiment of FIG. **1**;

FIG. **8** is a block diagram of a control system for the sampler;