APPARATUS FOR SAMPLING PESTICIDE RESIDUES IN RUN-OFF WITH CONTROL OF SAMPLE PUMP AND DISTRIBUTOR VALVE

FIELD OF THE INVENTION

This invention relates generally to water samplers and more specifically, to an improved water sampler apparatus for automatically capturing a sample in a liquid-solid extraction cartridge.

BACKGROUND OF THE INVENTION

An important water quality issue concerns the runoff of agricultural pesticides into lakes, streams, rivers, or other bodies of water. This runoff results in water contamination by semi-volatile organic compounds which are part of pesticide formulations. Presently used methods of sample collection for testing for organic contamination involve manually collecting large volume water samples and then transporting the samples to a laboratory for chemical analysis by the traditional liquid-liquid chemical extraction processes known in the art. Special inert containers and special handling techniques must be used to minimize contamination of the water sample and also to minimize hydrolysis reactions within the water sample between the time the sample is collected and the time it is analyzed. It will be appreciated tha such reactions can degrade the sample so that the analysis that is ultimately performed at the laboratory does not produce accurate information regarding the sample as originally taken.

There are several types of automatic samplers commercially available that process water samples by liquid-solid extraction of organic contaminants. However, these samplers are laboratory devices that are unsuitable for field use. There are also several types of automatic water samplers that are designed to sample sediment or inorganic contaminant concentrations in streams. These automatic samplers have a number of disadvantages. For example, the sample water generally comes in contact with materials in the sampler pumps and hoses which may contaminate the sample. Further, the water samples are stored in a bottle until the sampler is serviced and the sample is then transported to, and analyzed by, a laboratory so there is a problem of possible sample degradation as described above. In addition, the sample bottles are generally not made of inert materials, and thus may add to or absorb part of the organic contaminants in the sample, thereby degrading the sample or making the sample unsuitable for analysis. Further, the volume of the standard sample collected by such automatic samplers is sized for sediment or inorganic analysis and is insufficient for organic analysis

Methods for manually collecting samples suitable for organic contaminant analysis also have problems associated with them. For example, such a manual method requires a person to be at the sampling location at the correct time in order to manually catch the runoff water from a rainfall. Another drawback to the manual approach is that a large number of samples must be taken in order to produce an accurate result. Other drawbacks to manual sampling include high labor costs, high shipping and handling costs, and potentially poor sample integrity.

Several examples of water samplers are disclosed in U.S. Pat. Nos. 3,969,925 (Niskin); 4,533,643 (Bell et al.); and 4,871,662 (Rosov).

The Niskin patent discloses a device for removing particulate matter from a water sample. This removal is assisted by the use of a liquid additive. The sample is captured on a filter of a particular pore size and the filter must be changed to capture material of smaller sizes. This device only enables one sample to be taken at a time, and substantial manual labor is involved first collecting the initial sample and then resetting the device.

The Bell et al. patent discloses a sampler device which uses a fluid permeable filter and in which a solvent to separate the solid part of a slurry from the liquid to be tested. This device is used to separate a water sample from a slurry which is to be discarded and requires human supervision in the taking of a sample. This device also has the restriction of being only able to take only a single sample before needing to be emptied.

The Rosov patent discloses a sampler device which uses a coarse filter to extract large particles and a fine filter, which is coated with a stabilizing agent to capture microbiological samples from a water sample. This device requires an attendant to remove a cap and fill the water sampler to collect the sample. The device cannot collect multiple samples and thus an attendant must reset the device manually before each additional sample can be taken.

SUMMARY OF THE INVENTION

20 In accordance with the invention, an automatic sampler system is provided which is portable so as to permit use thereof in the field and which enables samples to be taken and stored in the field without degradation prior to laboratory testing. The system automatically collects water samples and separates any organic contaminants from the samples in a liquid-solid extraction cartridge. Once a sample is extracted into the liquid-solid extraction cartridge, the sample is chemically stable and resistant to contamination, and thus the special handling that is required with the prior art samplers discussed above is eliminated. The water sample is collected automatically in response to a given condition such as the passage of a preselected time period or the sensing of a rainfall by a sensor, and immediately pumped through the liquid-solid extraction cartridge which extracts and preserves the organic contaminants of interest until, as stated above, the sample is ready to be transported to, and analyzed by, a remote laboratory. Sample integrity is maintained by making all wetted parts in the system from inert, non-contaminating materials. As stated, the liquid-solid extraction procedure prevents further reaction by and consequent degradation of the organic contaminants of interest.

Other features and advantages of the invention will be set forth in, or apparent from, the following detailed description of preferred embodiments of th invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a sampler system constructed in accordance with a preferred embodiment of the invention;

FIG. **2** is a bottom plan view of the distributor valve of the system of FIG. **1**;

FIG. **3** is a top plan view of the distributor valve of FIG. **2**, partially broken away for illustrative purposes.

FIG. **4** is a transverse cross sectional view taken generally along line **4—4** of FIG. **3**; and

FIG. **5** is a detail of the encircled area of FIG. **3**.