have in memory an exact indication of where it is located. In that manner, the program may control the location of the outlet of the distributor hose to time the depositing of samples even though different arrangements of bottles may be used in the same container.

The sampler includes a random number generator so that samples will be taken at random times. The pattern is stored in memory. This prevents tampering with sample times by personnel working at a site in which monitoring is taking place. Standard bottles with standard samples may be included so that, if tampering occurs with the sample bottles, it may be detected by interrogating the memory to determine when samples were drawn from the body of water and into which containers they were deposited and which samples or sample bottles should have standard solutions or no solutions in them. Moreover, the software can be drawing and inserting one set of samples in containers according to one program and nonetheless simultaneously follow at least one other program. The other program or programs may be triggered during the first to start program such as by the detection of a programmed pH or flow rate.

From the above description, it can be understood that the pumping system of this invention has several advantages, such as for example: (1) it permits higher average pumping velocities under high head conditions with peristaltic pumps; (2) it provides longer life to peristaltic pump tubes; (3) it increases the life of tubes and reduces lateral movement; (4) it permits more precise positioning of the distributor outlet port; (5) it permits easy attachment of modules for cooperation with the sampler; (6) it permits safe and easy access to the pump tube for replacement thereof; and (7) it provides a security system to avoid tampering with samples.

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 block diagram of a pumping system in accordance with the invention;

FIG. **2** is an exploded perspective view of a sample collector using the pumping system of FIG. **1** in accordance with an embodiment of the invention;

FIG. **3** is a partially exploded, perspective view of a liquid sensing device used in the embodiment of the invention shown in FIG. **1**;

FIG. **4** is an exploded perspective view of a liquid sensing device used in the embodiment the invention shown in FIG. **1**;

FIG. **5** is an elevational sectional view of a portion of a liquid sensing device used in the embodiment of the invention shown in FIG., **3**;

FIG. **6** is a fragmentary, exploded perspective view of the liquid sensing device and pumping system used in the embodiment of the invention shown in FIG. **1**;

FIG. **7** is a fragmentary simplified perspective view of an embodiment of a sampler broken away to show a distributor and a bottle tub useful in the embodiment of FIG. **2**;

FIG. **8** is an exploded fragmentary perspective view of a pump, sensing section and distributor useful in the embodiment of FIG. **2**;

FIG. **9** is a fragmentary top elevational view of a portion of the sensing section of FIG. **8**;

FIG. **10** is a simplified, fragmentary perspective view of a pump roller assembly in accordance with the invention;

FIG. **11** is a simplified perspective view of an embodiment of pump and sensing system;

FIGS. **12** and **13** are simplified fragmentary perspective views of two other embodiments of pumping systems;

FIG. **14** is a schematic drawing of an air bubbler module in accordance with the invention;

FIG. **15** is a schematic diagram of the container full detection system;

FIG. **16** is a block diagram of a portion of the pumping system of FIG. **1**;

FIG. **17** is a block diagram of a portion of one of the embodiment of FIG. **16**;

FIG. **18** is a flow diagram of a portion of a program used to operate the sampler of FIG. **2**;

FIG. **19** is a flow diagram of a portion of the embodiment of FIG. **18**;

FIG. **20** is a flow diagram of still another portion of the embodiment of FIG. **18**;

FIG. **21** is a block diagram of still another portion of the embodiment of FIG. **18**;

FIG. **22** is a block diagram of another portion of the program of FIG. **18**;

FIG. **23** is a flow diagram of a portion of still another embodiment the program of FIG. **18**;

FIG. **24** is a flow diagram of a portion of the program segment of FIG. **18**;

FIG. **25** is a block diagram of still another portion of the embodiment of FIG. **8**;

FIG. **26** is a block diagram of another embodiment of FIG. **18**;

FIG. **27** is a flow diagram of another portion of the embodiment of FIG. **18**;

FIG. **28** is a block diagram of another portion of the sampler of FIG. **2**; and

FIG. **29** is a block diagram of still another program useful in the embodiment of FIG. **2**.

DETAILED DESCRIPTION

In FIG. **1**, there is shown a block diagram of a pumping system **10** having a flow measurement and control circuit **12**, a pulse sensor assembly **14**, a peristaltic pump **16**, a cycle signal generator **11** for generating signals indicating the cycles of the pump, a sample collector **18** and a conduit **20**. The conduit **20** is fastened to and communicates with an inlet straining device **22** and extends through the pulse sensor assembly **14**, the peristaltic pump assembly **16** and the sample collector **18** into which it supplies liquid.

The flow measurement and control circuit **12** is electrically connected to the pulse sensor assembly **14** to receive signals therefrom indicating pumping cycles of liquid after the liquid has reached a specific location and to control the peristaltic pump assembly **16** and sample collector **18** to deposit predetermined volumes of liquid into a sample container or a group of sample containers in accordance with a preprogrammed procedure or under the manual control of an operator.

The cycle signal generator **11** is connected to the rotor of the peristaltic pump in the peristaltic pump assembly **16** and generates a predetermined number of pulses for each cycle. These pulses are transmitted to the flow measurement and