POWER PURGED LIQUID SAMPLER

This invention relates to apparatus for taking measured samples of liquids with or without solids therein.

Although this sampling apparatus can be used with clear liquids, it is primarily intended for liquids including solids which are liable to cause blockages in the tubes and passages of the apparatus. For example, the apparatus can be used for taking samples of liquids in commercial operations in order to keep track of the consistency of the liquids for analysis, or in chemical or sewage plants.

There are many different types of sampling apparatus in existence today. However, some of the prior samplers cannot be used with liquids having solids therein, while others of the samplers do take samples from such liquids, but are subjected to blockages, and therefore the sample volumes are not consistent.

The sampler in accordance with this invention practically eliminates these problems. It includes a system for blowing out the sample lines so that if they do become blocked by the solids in the liquid, they are cleared by the blowing operation. In addition, this sampler includes means for taking exactly a desired quantity of each sample each time the apparatus is in operation. This is done even when temporary blockages occur during the taking of any sample. As a result, the sampling apparatus can operate for long periods without any special attention even though the type or amount of the solids in the liquid causes numerous or even constantly-occuring blockages.

Apparatus for taking measured samples in accordance with the present invention comprises a closed metering chamber, a volume control tube extending into the chamber and having a lower end above the bottom thereof, the liquid being sampled entering the chamber through this tube, a source of positive and negative pressure operatively connected to the chamber near the top thereof, a means causing said source alternatively to apply vacuum and pressure to the chamber for predetermined periods, and a level controller in the chamber above the lower end of the control tube and connected to said source to operate the latter to shut off the vacuum and start the pressure when liquid in the chamber reaches a predetermined level, said pressure forcing the liquid out through the control tube until the level of the liquid reaches the lower end of said tube. The container now holds a predetermined volume of the liquid, and this volume is determined by the position of the lower end of the control tube above the bottom of the chamber. It is preferable that this tube can be adjusted vertically in order that the apparatus may be set to take different quantities of liquid as samples. Although the sample liquid can be removed manually from the chamber, it is preferable to provide an outlet at the bottom of the chamber controlled by a valve so that the valve can be opened after the liquid level in the chamber reaches the lower end of the control tube. With this arrangement, the measured sample is automatically dumped from the chamber.

Examples of this invention are illustrated in the accompanying drawings, in which

FIG. 1 is a front elevation of sampling apparatus in accordance with this invention,

FIG. 2 is a plan view of the apparatus with the top of the cabinet thereof broken away,

FIG. 3 is a diagrammatic layout of one form of the apparatus as it is set when suction is being applied to the chamber,

FIG. 4 is a fragmentary diagram showing part of the apparatus of FIG. 3 when pressure is being applied to the chamber,

FIG. 5 illustrates an example of a program timer used in the apparatus of FIG. 3,

FIG. 6 is an enlarged perspective view of two cams of this program timer,

FIG. 7 is a diagram of the wiring of said apparatus,

FIG. 8 is a diagrammatic layout similar to FIG. 3, illustrating an alternative form of the apparatus, and

FIG. 9 is a diagram of the wiring for the apparatus of FIG. 8.

Referring to the drawings, **10** is a sampler apparatus in accordance with this invention. This apparatus includes a cabinet **11** having an upper section **12** and a lower section **13.**

A closed metering chamber **18** is mounted in the upper section of cabinet **11.** Although this chamber may be of any desired shape, it is preferably of tubular shape, as shown, and has a cylindrical wall **20** which is preferably formed of transparent material, this wall having graduation marks **21** thereon. These marks indicate different volumes within the chamber, and for example, the volume between any two of these marks may be 100 cc.

A volume control tube **25** extends through a cover **26** of the chamber and down into said chamber, and this tube is preferably adjustable vertically so that the lower end **28** thereof can be set at different positions relative to the chamber bottom **29.** A tube or hose **31** is connected to the outer end of tube **25** and extends out of the cabinet, this hose being long enough to extend into the liquid from which samples are to be taken.

Although for some purposes chamber **18** may not need an outlet at the bottom it is preferable to provide an outlet opening **32** in the bottom **29** thereof. An outlet tube **33** extends from outlet **32** down into a container or jar **36** positioned in the lower section **13** of the cabinet. A shut-off valve is provided for controlling the outlet from the chamber, and in this example, the valve is in the form of a pinch valve **39** which can be operated to squeeze and close off tube **33** when desired. Valve **39** is operated in any suitable manner to open and close off outlet tube **33,** such as by a solenoid **40,** as shown in FIG. **3.**

A level controller is provided in chamber **18** above lower end **28** of control tube **25.** In this example, the level controller is in the form of a pair of electrodes **42** that project downwardly from chamber top **26** into the chamber.

A vacuum/pressure tube **43** extends from within chamber **18** near the top thereof through top **26** and to a water trap **44.** If desired, a gauge **45** may be connected to tube **43.** Another tube **47** extends from trap **44** to a solenoid vacuum valve **49** and a solenoid pressure valve **50.** A suitable control, such as a needle valve **52** is positioned in the portion of pipe **47** extending to valve **49.** A suitable vacuum pump **56** is provided, this pump being driven by an electric motor, not shown. The suction side of pump **56** is connected by pipe **58** to valve **49,** while the pressure or outlet side of said