

AUTOMATIC LIQUID SAMPLE TAKING AND SEGREGATING APPARATUS

This invention relates to apparatus for automatically taking samples of liquid with or without solids therein and segregating these samples.

There are prior devices on the market for taking measured samples, but these are rather cumbersome, and measure the samples by time instead of volume, and as the conditions of the liquid usually keeps changing, the timed samples are not all of the same volume. If the sample-taking apparatus is portable and is placed at different heights relative to the liquid, or if the level of the liquid rises or falls, the volume of the samples taken changes. A further disadvantage of the prior devices is that they take each sample relatively slowly, so that if there are solids in the liquid, some separation takes place, making the samples unrepresentative of the liquid being sampled.

Apparatus according to this invention measures the samples by volume so that all samples are of the same volume. This apparatus takes each sample very rapidly so that there is no time for any separation of suspended solids.

The present apparatus takes successive samples at predetermined times and deposits these samples successively in a plurality of bottles. The apparatus can be adjusted so as to direct one or more successive samples in each bottle. This apparatus is relatively small and easily portable, although it includes a relatively large number of large sample bottles, for example 24 bottles. These bottles are so arranged that they take up very little space and so that ice can be kept in contact with each bottle when this is necessary. The apparatus is completely automatic, and has safeguards against malfunctioning.

Apparatus in accordance with this invention for taking and segregating measured-by-volume samples of liquid with or without solids therein, comprises a closed metering chamber, means for drawing a predetermined volume of a liquid being sampled into said chamber, a liquid outlet in the chamber, valve means for closing and opening said outlet, a spout having an inlet end connected to the chamber outlet to receive liquid from the chamber when said valve means opens the outlet and an opposite discharge end, said spout being movably mounted so the discharge end can be moved along a predetermined path, a plurality of sample bottles mounted along said path and each having an entrance opening, and means for indexing the spout to move the discharge end thereof successively into registry with the bottle entrances openings.

An example of the present apparatus is illustrated in the accompanying drawings, in which:

FIG. 1 is a front view of the apparatus with the door of the housing thereof open,

FIG. 2 is an enlarged vertical section through the metering chamber of this apparatus,

FIGS. 3 and 4 are diagrams of suction-pressure means for the metering chamber,

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

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

FIG. 7 is a horizontal section taken on the line 7-7 of FIG. 1,

FIG. 8 is an enlarged perspective view of a sample bottle,

FIG. 9 is a fragmentary sectional view taken on the line 9-9 of FIG. 7,

FIG. 10 is an enlarged horizontal section taken on the line 10-10 of FIG. 1,

FIG. 11 is an enlarged sectional view through the spout-moving mechanism,

FIG. 12 is a horizontal section taken on the line 12-12 of FIG. 11,

FIG. 13 is a diagram of an example of the main electrical system for this apparatus, and

FIG. 14 is a wiring diagram for the distributing section of the apparatus.

Referring to the drawings, 10 is sample-taking apparatus in accordance with this invention. This apparatus includes a housing 11 having an upper section 12 and a lower section 13. The apparatus is preferably portable, and has a door 14, part of which is shown in FIG. 1 in an open position.

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 ccs.

Suitable means is provided for adjusting and controlling the volume of liquid drawn into chamber 18 each time this apparatus operates. In FIG. 2, this control means comprises a volume control tube 25 extending 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 30 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, not shown, from which samples are to be taken.

Chamber 18 is provided with an outlet opening 31 in the bottom 29 thereof, said bottom preferably being dished towards the outlet, as shown at 32 in FIG. 2. An outlet tube 33 extends downwardly from the metering chamber, and a shut-off valve is provided for controlling the outlet. 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.

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.

Instead of having a tube 25 for controlling the volume of liquid drawn into chamber 18, one of the electrodes 42 can extend down to near the bottom of the chamber, and the other electrode can terminate near the chamber top. In this case, the latter electrode is adjustable vertically relative to 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, see FIG. 3. 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