

FLOW AND TIME PROPORTIONAL SAMPLING SYSTEM

CROSS REFERENCE

This application is a continuation-in-part of copending application Ser. No. 455,879, filed Mar. 28, 1974, now abandoned.

BACKGROUND OF THE INVENTION

The invention disclosed herein relates to sampling of a fluid flow which may proceed unattended for an extended period, and more particularly to a system for sampling which is proportional to either time or flow volume and which provides a predetermined sample volume of fluid which is truly representative of the actual fluid passing through the flow channel.

Flow meters in the past for use with flow sampling systems have been of the type providing questionable flow volume accuracy due to known deficiencies in the flow sensitive structure and due to clogging which occurs in impeller, orifice, or venturi type flow measurement devices. Moreover, samplers for operation in conjunction with such flow meters are subject to internal corrosion, clogging, variation in sample size and misrepresentative sample draw, which leaves subsequent analysis of samples taken as questionable means for determining the true character of the flow sampled. Samplers for use in circumstances requiring samples to be drawn per increment of time are generally not adaptable for use where samples are desired at increments of flow volume through the flow channel.

There is therefore a need for a flow and time proportional sampling system which may be used in either set of circumstances by merely pre-setting controls, or which may be operated manually if desired. Accurate and representative samples are needed for meaningful monitoring of the characteristics of the fluid flow.

SUMMARY AND OBJECTS OF THE INVENTION

A flow and time proportional sampling system is disclosed which provides stored samples for subsequent analysis utilizing a fluid flow sampler which provides a sampling sequence initiated by an appropriate input signal. The input signal may be provided by an integral timer for time base sampling, by manual actuation of an associated switch, or by a fluid flow meter for flow volume base sampling. The flow meter senses fluid head in a flow channel and contains a servoed mechanical head to flow converter with multiple channel cross section shape and size measuring capabilities. The sampling sequence includes initial actuation by the input signal of a compressor for providing a positive and negative pressure source. A timed sequence is also initiated by the input signal. The timed sequence includes chamber purging, chamber filling, sample sizing, sample storage, and sequence resetting to place the system in a ready condition to receive the ensuing input signal.

It is an object of the present invention to provide a flow proportional sampling system which makes possible an accurate quantitative and qualitative effluent measurement.

Another object of the present invention is to provide a flow proportional sampling system having controls for accommodating accurate flow measurement through channels of various cross sectional shapes and various

cross section dimensions within any general cross sectional shape.

It is another object of the present invention to provide a flow proportional sampling system indicating instantaneous flow rate as well as total flow.

It is another object of the present invention to provide a fluid flow sampling system which is portable and easy to install.

It is another object of the present invention to provide a fluid flow sampling system which draws fluid samples in seconds for obtaining a truly representative flow sample.

It is another object of the present invention to provide a fluid flow sampling system which provides a constant sample size independent of intake dimensions, power source voltage, flow head, or the like.

It is another object of the present invention to provide a fluid flow sampling system which is self-purging.

It is another object of the present invention to provide a fluid flow sampling system which stores the flow samples in individual storage containers or a single storage container as desired.

It is another object of the present invention to provide a fluid flow sampling system with multiplexing capability for either storing a predetermined number of samples in each storage container, or a given sample in a predetermined number of storage containers.

It is another object of the present invention to provide a fluid flow sampling system which is time proportional for obtaining samples from the fluid flow at predetermined increments of time.

It is another object of the present invention to provide a fluid flow sampling system having a sampling sequence which may be initiated manually.

It is another object of the present invention to provide a fluid flow sampling system which is de-energized until attended after receiving a predetermined number of samples, thereby preventing adulteration of previously received samples.

Additional objects of the present invention will become apparent by reference to the following description of the invention and the associated drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view of a flow and time proportional sampling system installed in a sewer riser.

FIG. 2 shows an isometric exploded view of a portable sampler.

FIG. 3 is a block diagram of the sampler.

FIG. 4 is a mechanical schematic of the sampler of FIGS. 2 and 3.

FIG. 5 is an electrical schematic of the sampler.

FIG. 6 is an isometric view of a portable flow meter.

FIG. 7 is a block diagram of the flow meter.

FIG. 8 is a mechanical schematic of the flow meter of FIGS. 6 and 7.

FIG. 9 is an electrical schematic of the flow meter.

FIG. 10 is a plan view of the sampler control panel.

FIG. 11 is a plan view of the flow meter control panel.

FIG. 12 is a block diagram of an additional sampler embodiment.

FIG. 13 is a mechanical schematic of the sampler of FIG. 12.

FIG. 14 is a mechanical schematic of another sample chamber embodiment.