AIR QUALITY SAMPLER

BACKGROUND OF THE INVENTION

The present invention relates to monitoring a gas atmosphere and, more particularly, to a gas sampler which is programmable to automatically collect into individual containers, given quantities of an atmosphere at different time intervals.

In the study and handling of air pollution, it is often desirable to determine the character and concentration of pollutants at any given location at different times. For example, in studying pollution generated by automobiles in the vicinity of a highway or freeway, a comparison between traffic density and the resulting pollution is often important. Making such a comparison requires numerous measurements to be taken adjacent to the roadway at different times. Moreover, it is often desirable to determine whether or not pollutants from a known pollution sources are reaching a given location and, if they are reaching the location, when and in what concentration.

In order to obtain pollution measurements at differing times at a specific location, it has generally been necessary for personnel to be at the location at such times, and either make the measurement directly at the site or obtain a sample of the atmosphere at such site for later analysis in a laboratory. Neither of these procedures, however, is entirely satisfactory. The necessity for personnel to be at the site at the time of measurement not only adds to the expense, but reduces as a practical matter the number of differing sites which can be serviced in any given time period. In addition, on-site air pollution measurement apparatus is generally quite sophisticated and expensive.

SUMMARY OF THE INVENTION

The present invention is a simple and inexpensive air quality sampler which enables a plurality of samples to be automatically obtained from a given location at differing selected times. In its basic aspects, the apparatus simply includes a plurality of sample containers, such as inflatable, gas-impermeable bags, and pumping means for directing a quantity of the gas to be sampled into each of the containers. It further includes control instrumentation connectable with such pumping means for governing when the pumping means directs the gas sample into any one of the containers. With this arrangement, it will be recognized that with appropriate programming of the control instrumentation, samples of the atmosphere at the location of the apparatus can be collected at differing times and segregated for later analysis, merely by keeping track of which container receives a sample at any given time. Numerous samples can thus be taken at a remote location without the necessity of personnel being available during the sampling.

Most desirably, the control instrumentation includes programming means which permits an operator to change the time interval during which the pumping means directs a gas sample into each of the containers. The arrangement then enables an operator to "tailor" the apparatus to obtain air samples at any given site at those times deememd to be of most interest. Moreover the pumping means preferably includes a plurality of pumps, the output of each of which is connected with an associated one of the containers. The inclusion of a separate pump for each of the containers obviates the need for a complex valving and air plumbing arrangement and the necessary sophisticated control therefor. Moreover, the utilization of a pluraity of pumps, rather than a single, continuously operating pump, greatly increases the life expected from the system.

As another salient feature of the instant invention, it includes flow rate selection means for determining the rate of flow of gas into each of the containers during the time interval within which the pump associated with such control means is activated. Most effectively, such flow rate selection means varies the flow rate of the pump not by increasing or decreasing the operating pumping rate of the pump, but by periodically stopping and starting the operation of the pump during the full time interval when it is activated to take a sample. The resulting intermittent operation of the pump during the selected time interval provides the desired average flow rate, while also collecting gas from the atmosphere at times during the full time interval so that the resulting sample is an integration of the gas make-up during such full time interval. Intermittent operation of a pump to obtain a desired flow rate also eliminates the need for special (and more expensive) pumps having variable pumping speeds, besides resulting in a power saving advantage. That is, because the average power consumed by a pump at the typically low flow rates employed in gas sampling is directly related to its operating duty cycle, less power is used to periodically operate a pump than to continuously operate a similar pump providing the same overall flow rate. Additional power saving is obtained by utilizing for the power source, battery cells which recuperate between uses.

There are other advantages and features of the instant invention which will become apparent or will be described in connection with the following description of a preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

With reference to the accompanying three sheets of drawings:

FIG. **1** is a partly broken-away, elevation view of a preferred embodiment of the air quality sampler of the invention;

FIG. **2** is an enlarged cross-sectional view of the top of the sampler of FIG. **1**, illustrating the mechanism and instrumentation therefor;

FIG. **3** is a further enlarged view showing details of one of the pumps of the apparatus and its relationship to other components of the air sampler;

FIG. **4** is an enlarged top plan view of the cover on said air sampler, and

FIG. **5** is a schematic diagram of the control instrumentation for the air sampler and its relationship to other mechanisms thereof.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

With reference first to FIG. **1**, a stand-alone air quality sampler of the invention is generally referred to by the reference numeral **11**. As is illustrated, such air quality sampler includes a protective enclosure **12** for housing collected samples of a gas, and an upper or cover portion **13** for the enclosure which also inclludes the operating mechanism for obtaining the gas samples. The protective enclosure is, as is illustrated, simply in the form of a barrel or similar housing. Most desirably, such enclosure is portable to enable the air sampler to be simply moved to any location at which it is desired