RAIN SAMPLING DEVICE

This invention was made with government support under contract number DE-AC06-76RLO 1830, awarded by the U.S. Department of Energy. The government has certain rights in the invention.

This is a continuation of application Ser. No. 07/198,192, filed May 24, 1988, and now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to weather monitoring equipment and more particularly to rain sampling devices capable of independent operation at remote locations.

In recent years concerns have arisen about the chemical composition of rainfall. In particular, acid rain has been shown to have a detrimental impact on the environment. Consequently, it has become important to be able to sample rainfall according to predetermined schedules at remote locations. Rain sampling devices have been built in the past, but they have tended to be comparatively complex and expensive devices which have been difficult to maintain in the field. Further, past rain sampling devices have allowed for relatively short periods of operation, since by design they have required significant amounts of battery power to be supplied on a continuous basis.

It is therefore an object of the present invention to provide a rain sampling device which is of comparatively simple construction and therefore has a greater degree of functional reliability.

It is another object of the present invention to provide a rain sampling device which conserves electrical power during periods when the device need not be fully operative.

It is a further object of the present invention to provide a rain sampling device which is inexpensive to construct yet efficiently accomplishes its purposes.

SUMMARY OF THE INVENTION

The present invention constitutes a rain sampling device adapted for independent operation at locations remote from the user which allows rainfall to be sampled in accordance with any predetermined schedule desired by the user. The rain sampling device includes a mechanism for directing wet precipitation into a chamber, a chamber for temporarily holding the precipitation during the process of collection, a valve mechanism for releasing samples of said precipitation from said chamber in response to a control signal, an electrical mechanism for controlling the operation of the device and a means for distributing the samples released from the holding chamber into vessels adapted for permanently retaining the samples.

In the preferred embodiment, the valve mechanism includes a magnetically actuated plunger which alternatively seals the exit or entrance to the holding chamber in accordance with power being applied to a coil. The electrical control means includes a programmable microcomputer which is adapted for allowing the user to implement any sampling schedule desired. The sampling device also includes a mechanism for activating and deactivating the majority of the components in the system by engaging and disengaging power to these components. The power is disengaged in order to conserve energy whenever samples are not required to be taken and is engaged only when precipitation is sensed by a moisture detector and/or start-up signals are provided by a real-time clock device. The preferred embodiment of the rain sampling device further includes a ring gear rotatable in accordance with signals from said electrical control means having a special channel for distributing precipitation samples into different ones of the retaining vessels.

The subject matter of the present invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. However, both the organization and method of operation, together with further advantages and objects thereof, may best be understood by reference to the following description taken in connection with accompanying drawings wherein like reference characters refer to like elements.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagrammatic side view of the rain sampling device of the present invention;

FIG. **2** is a cross-sectional view of the holding chamber and valve mechanism components of the rain sampling device of the present invention;

FIG. **3** is a detailed side view of the dispensing system component of the rain sampling device of the present invention;

FIGS. **4A** and **4B** are top and side views of the ring gear element of the rain sampling device of the present invention;

FIG. **5** is a top view of the lower support plate element of the rain sampling device of the present invention;

FIG. **6** is a top view of the base plate element and the distribution tubes, entrance fittings and exit fittings associated therewith in the rain sampling device of the present invention;

FIG. **7** is an electrical block diagram of the microcomputer system component of the rain sampling device of the present invention;

FIG. **8A** is a flow diagram illustrating the various operations performed in the rain sampling mode by the microprocessor system component of the rain sampling device of the present invention;

FIG. **8B** is a flow diagram of the power up process of the rain sampling device of the present invention; and

FIG. **8C** is a flow diagram of the power down process of the rain sampling device of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. **1**, the rain sampling device **10** of the present invention includes a chamber **12** in which wet precipitation (rain) may be collected. The chamber **12** receives precipitation by way of a funnel **14** and tube **16** which divert precipitation from a broad area into the chamber **12**. A hinged lid **15** is attached to the device **10** near the top of the funnel **14** for preventing precipitation from entering the funnel **14** and being collected during periods when samples are not desired to be taken. A valve mechanism **20** (not shown in FIG. **1**) is associated with the chamber **12** for releasing samples from the chamber **12** when a sufficient quantity of precipitation has been collected. A dispensing system **22** is secured to the bottom end of the chamber **12** for directing samples released from the chamber **12** into one of several sample retaining vessels **24**. A microcomputer system **26** controls the functioning of the device **10** by