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FLUID SAMPLER

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ABSTRACT OF THE DISCLOSURE

Apparatus for sampling fluids from a flowing stream. The apparatus, of tubular shape, is dual compartmented, i.e., it is provided with a first and a second compartment. The first compartment is provided with a fluid inlet port and the second compartment with a fluid outlet port. The fluid inlet port is opened and closed via a rotatable disc which also contains an opening for alignment with the fluid inlet port to open and close the latter. A worm conveyor, rotatably mounted within the first compartment, actuates the disc. The worm conveyor is operatively connected, via suitable gearing mechanism, preferably variable, located within the second compartment, to external fluid actuable driving means. The moving stream, from which the sample is taken, actuates the worm conveyor itself so that the rotating disc opens and closes the fluid inlet port in the first chamber to admit increments or spurts of fluid into the first chamber. Simultaneously, fluid is expelled through the outlet port for collection.

The necessity of obtaining truly representative samples from such streams, however, increases almost daily. The increasing demands for the elimination of polluting materials from streams is now constantly heard even by lay persons from day-to-day. Elimination of such materials from streams must begin with truly representative samples for analysis.

Accordingly, it is the primary objective of the present invention to obviate these and other problems by providing new and improved apparatus for accurately sampling the fluid of flowing streams.

In particular, it is an object to provide an apparatus for sampling flowing streams, the fluid being withdrawn therefrom being obtained in accurate and direct proportion to the velocity of flow of the stream.

More particularly, it is an object to provide apparatus of such character adapted for location within a pipe or conduit for sampling the flowing fluid.

A further object is to provide apparatus of such character which is directly actuated by the movement or flow of the fluid, so that the sample obtained is not significantly affected, if any, by variations of temperature and pressure.

A yet further and more specific object is to provide a fluid sampler or device capable of selectively positively withdrawing increments of fluid from a flowing stream, over a period, for delivery of same to provide a composite fluid specimen representative of the total sampled stream.

These and other objects are achieved in accordance with the apparatus of the present invention which comprises a dual compartmented cylindrical chamber of tubular design with stationary end walls and stationary intermediate wall. The forward wall of the first chamber contains a fluid inlet port, and within the said first chamber is journalled a worm conveyor, including a central shaft surrounded by a helical screw or blade. A perforated disc, provided with a fluid inlet port, is secured to the forward end of the worm conveyor and a flat side thereof lies adjacent the forward wall of the first chamber

to form a seal and also a valve. As the disc rotates with the screw conveyor, alignment and misalignment of the inlet ports of the forward wall and disc thus occur, this opening and closing the chamber to the intake of fluid. A fluid outlet port is provided within the said first chamber.

Means are provided external to the chambers for actuation by the flowing stream. Such means is preferably a rotary member, or members, whose angular velocity of rotation is in direct proportion to the rate of flow of the fluid. The means thus contemplates on more rotary members provided with concave surfaces—viz., disked cups, paddles, or the like—upon which the fluid impinges. The rotary members are operatively connected to or associated with coupling or gearing means located within the second compartment, as via a shaft extending into the said second compartment, for actuation and rotation of the worm conveyor.

Actuation of, e.g., the rotary member, or members, by the flowing stream thus produces a rotation of the worm conveyor directly proportional to the rate of flow of the moving stream. The inlet ports of the forward wall and disc open and close the first chamber and, by the forceful action of the rotating worm conveyor, increments or spurts of fluid are positively selectively withdrawn from the stream. Simultaneously, fluid is displaced and forcibly ejected through the outlet port of the first chamber for collection.

These and other features and advantages will be better understood by reference to the following detailed description and to the accompanying drawings to which reference is made in the description.

Referring to the drawings:

FIG. 1 is a plan view, in partial section, showing a preferred type of fluid sampler wherein fluid responsive means are actuated by the fluid of the flowing stream itself to positively selectively withdraw increments of fluid from the said stream for delivery at controlled rates;

FIG. 2 is a front elevation view, taken along section 2—2 of the preceding figure showing the details of a valve arrangement at the forward end of the fluid sampler to provide for ingress of fluid into the forward chamber thereof;

FIG. 3 is a side elevation view, taken along section 3—3 of FIG. 1, showing the details of a preferred type of externally located means for actuation by the flowing stream;

FIG. 4 is a side elevation view showing means for the mounting of the fluid sampler within a conduit for withdrawal of fluid samples for delivery to an isolated collection stage; and

FIG. 5 is a fragmentary section view of a preferred type of variable gear arrangement, with removable end cover for ease of access, for predetermined sample withdrawal frequency, and delivery.

Referring to FIG. 1, there is shown a preferred fluid sampler **10**, which includes generally the combination of a worm conveyor **20** fitted snugly within a barrel or tubular chamber **11**, the worm conveyor **20** being driven by fluid responsive means, preferably a pair of paddle-wheel drivers **31**, **32** mounted on a shaft **33** operatively associated with a shaft portion **21** of the worm conveyor.

The stationary end wall **12** of the tubular chamber **11** is provided with one or a plurality of openings **13**, as is an adjacent disc **22** which contains an opening **23**. The opening **13**, in combination with the rotating disc **22** with its opening **23**, acts as a valve. The disc **22** is thus rotated by actuation of the worm conveyor **20**, so that upon alignment of the openings **13**, **23** increments of fluid are sucked into, or positively withdrawn from, the stream and brought into the tubular chamber **11**. The increments of fluid are thereby isolated from the moving fluid of the