

## LIQUID SAMPLER

### BACKGROUND OF THE INVENTION

The present invention relates to liquid samplers. Apparatus for sampling liquids are well known. They are frequently provided to sample liquids in, for example, a pipeline.

Although the invention is not restricted to the following use, samplers for bunker fuel oil are particularly difficult to design. The reason for this is that bunker fuel for ships tends to be of very low quality and generally comprises the residue of the oil after the more usable parts have been removed mixed with diesel fuel. The fuel oil tends to be very waxy and, indeed, unless it is kept hot may solidify.

It is desirable to sample bunker fuel as it is being loaded into a ship because its constituents can vary and it is common to sample such bunker fuel so as to determine its constituents for future analysis. It is common practice for three samples to be kept in separate containers, one by the ship owner, one by the fuel supplier, and one for retention for later analysis/arbitration if so required.

A known arrangement of sampler comprises a valve mechanism which is rotated, rotation of the valve mechanism selectively passing a sample of liquid within the pipeline to three sampling jars, the rotation of the valve being carried out by a drive system driven by means of a propeller within the pipeline so that the propeller rotates in accordance with the flow of bunker fuel and the amount of bunker fuel collected, therefore, is in some way dependent upon the amount of bunker fuel passed along the pipeline. Such an arrangement is useful particularly in that it does not require an outside power supply (which is highly desirable in the somewhat explosive environment that the sampler operates).

However there are some difficulties, particularly caused by the fact that the bunker fuel tends to be waxy and solidify.

### SUMMARY AND OBJECTS

The present invention provides a sampler for flowing liquid in, for example, a pipeline, said sampler comprising:

- a pump assembly situated within the flowing liquid for pumping the liquid under pressure;
- sampling means connected to said pump assembly to provide a sample of said liquid;
- drive means to operate said pump assembly, said drive means including means, such as a propeller mean, mounted within said flowing liquid to be driven by the flowing liquid;
- said drive means being coupled to said driven means such that a rate of providing liquid samples is proportional to a rate at which the liquid is flowing in the pipeline;
- whereby the flowing liquid drives the means which in turn drives the drive means and the pump assembly.

By utilising power from the propeller driven by the liquid in the pipeline, the apparatus is self sufficient and does not require an outside power source. The use of one or more propellers assists in mixing the liquid being sampled.

The apparatus is provided with the pump assembly within the pipeline which thereby keeps the pump assembly warm and so that positive pressure is applied to

the liquid to discharge the liquid outside the pipeline and this reduces the possibility of blockage due to the sampled liquid solidifying.

The sampler may include a columnar member for insertion into the pipeline through a side aperture, and may include a plate means to close the side aperture. The drive means may comprise a shaft extending from the propeller into a housing outside the pipeline, and the housing may mount a variable reduction gearbox, the output of the reduction gearbox driving a camshaft. The camshaft may drive direct, or via a rocker, a shaft which extends down to the pump assembly and thereby operates the pump assembly. The pump assembly may include a liquid inlet, whereby liquid within the pipeline may flow into the pump assembly, and check valves to eject liquid out of the pipeline to the sampling means under the control of the camshaft.

### BRIEF DESCRIPTION OF THE DRAWINGS

Liquid samplers providing preferred arrangements of the invention will now be described by way of example only and with reference to the accompanying drawings in which:

FIG. 1 is a side view of a first sampler according to the invention,

FIG. 2 is a plan view of the sampler of FIG. 1,

FIG. 3 is an enlarged section of the pump assembly of FIG. 1,

FIG. 4 is a partial vertical section of a second sampler according to the invention, and,

FIG. 5 is a horizontal section of the sampler of FIG. 4.

### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIG. 1 there is shown a side view of a bunker fuel oil sampler 10 mounted in a pipeline 11. The sampler 10 comprises a columnar member 12 which extends into the pipeline 11 through an aperture 13, a flange plate 14 of the sampler 10 closing off the aperture 13. Mounted to the flange plate 14 outside the pipeline 11 is a housing 16 which encloses part of a drive system.

The lower end of the columnar member to mounts, on each side thereof, a respective propeller 17,18, the propellers being mounted on a single bearing mounted shaft 21. The axis of the propellers 17,18 are arranged to be generally coaxial with the longitudinal axis of the pipeline 11. The middle of shaft 21 mounts a bevel gear 23 which meshes with a bevel gear 26 attached to the lower end of a bearing mounted vertical shaft 27 which runs up the columnar member 12.

Mounted to the lower most point of the columnar member 12 is a plate 28 which forms a flow straightener between the propellers 17,18 to increase the power output of the device.

The vertical shaft 27 passes up through the flange plate 14 and mounts at its upper end a spur gear 29. The spur gear 29 meshes with a reduction gear train 31 mounted on the flange plate 14. The output of the reduction gear train 31 is passed to a gear 32 mounted on an upright bearing mounted shaft 33 carrying at its upper end a bevel gear 34; the bevel gear 34 meshes with a bevel gear 36 forming part of a horizontal camshaft 37, the camshaft 37 including three cams 38,39,40 against which bear three rockers 41,42,43 mounted to a rocker shaft 44. The fingers of the rockers 41-43 opposite the cams 38-40 bear on the top end of three hollow