# United States Patent

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[72] Inventor **Robert W. Starks**
**Merrillville, Ind.**



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[73] Assignee **Phillips Petroleum Company**


[54] **SAMPLING APPARATUS**
**4 Claims, 2 Drawing Figs.**


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[50] **Field of Search** ..... 73/422; 277/4, 91



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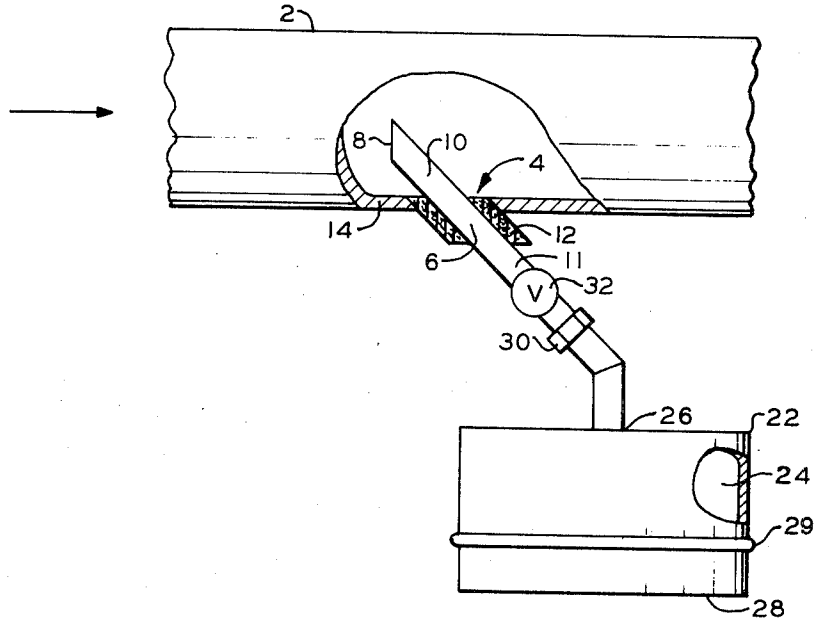
*Primary Examiner*—Louis R. Prince
*Assistant Examiner*—Daniel M. Yasich
*Attorney*—Young and Quigg



**ABSTRACT:** An apparatus for removing samples of product flowing through a conduit. The apparatus has a rotatable and reciprocal sample tube disposed within the conduit with said tube being movable to various positions within the conduit.

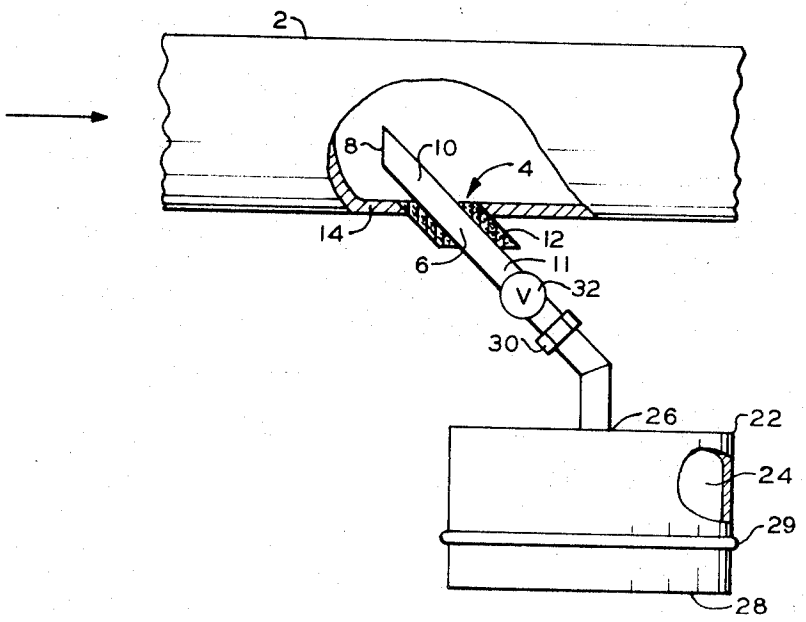



FIG. 1

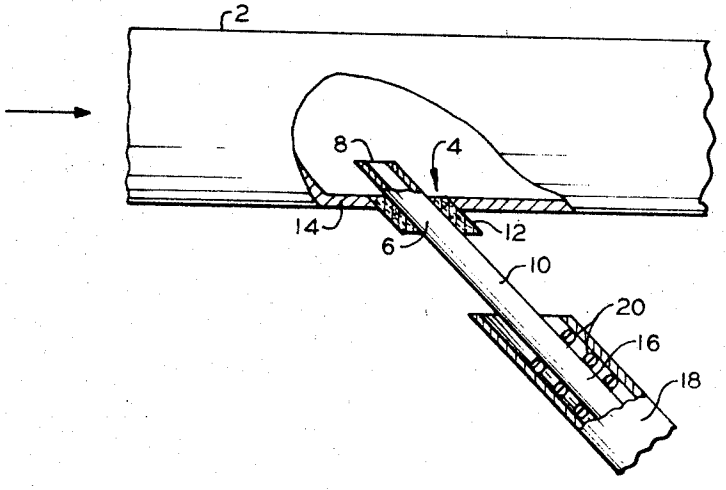



FIG. 2

INVENTOR.
R.W. STARKS

BY Young & Quigg

ATTORNEYS

# SAMPLING APPARATUS

This invention relates to a sampling device. In another aspect, this invention relates to an apparatus for continuously removing a sample of product flowing through a product conduit.

In heretofore utilized sampling apparatus for removing a sample of product flowing through a product conduit, the inlet end of the sampler was disposed in the conduit at a fixed position. When the product to be sampled comprised, for example, granular material having different sized particles or a mixture of granular materials with the components of the mixture having sometimes different sizes and configurations, it was often impossible to recover a representative sample of that product. The principal reason for this difficulty resulted from gradation of product flowing through the product conduit. During movement of the product through the conduit, the material having a higher density tends to flow along the bottom of the conduit with lighter components moving through the upper portion of said conduit. Where the product material was of the same composition, but having different size particles, the particles having a greater volume generally moved through the upper portion of the conduit with smaller particles occupying the lower portions of said conduit. In order to alleviate these difficulties, these fixed sample tubes were generally located near the inlet of the product conduit in order to obtain a representative sample prior to product gradation while flowing through said conduit. This, however, was often impossible owing to the construction of the plant and the space needed for installing a sampling station. The heretofore utilized sampling apparatus also generally comprised complex shutoff gates, automatic valves and the like. These devices often malfunctioned owing to the atmosphere in which they operated and often required a great deal of supervision and maintenance.

It is therefore an object of this invention to provide a sampling device for removing product from various positions within a product stream flowing through a product conduit. Another object of this invention is to provide a sampling apparatus that is of simple construction and can be manipulated to control the rate of product removal from the conduit. Yet another object of this invention is to provide a rugged and simply constructed and operated sampling device. Other aspects, objects, and advantages of the present invention will become apparent from a study of the disclosure, the appended claims, and the drawing.

The drawings show the apparatus of this invention and the product conduit. In the drawing, FIG. 1 is a diagrammatic frontal view of the apparatus of this invention installed on a product conduit and FIG. 2 is a diagrammatic frontal view of a portion of another embodiment of the sampling apparatus with the sample tube at a different position.

Referring to FIG. 1, a product conduit 2 extends, for example, from a pellet mixing machine to a bulk storage tank (not shown). The conduit 2 has a port 4 formed through a wall of the conduit 2 on the lower surface of the conduit 2. The port 4 is positioned on the lower surface of the conduit 2 in order that a sample tube 6, disposed therein,, can be moved relative to the conduit 2 to position an inlet end 8 of the tube 6 adjacent the lower portion of conduit 2 and provide for movement of product through the sample tube. The port also opens into the conduit 2 at an angle toward the opposed direction of product movement through said conduit 2. The sample tube 6 is elongated and has an inlet end 8 within the product conduit 2, a body 10 extending through the port 4 and an outlet end portion 11 spaced from the conduit 2. The inlet end 8 of the sample tube 6 is open on an angle relative to a perpendicular plane through the longitudinal axis of the tube 6. A sample tube 6 is rotatable about its longitudinal axis and movable along the longitudinal axis of the tube 6 for placement of the inlet end 8 of the sample tube 6 at desired positions relative to the pathway of the product flowing through the conduit 2 and removing a portion of the product therefrom. Packing means



12, such as a rubber gasket, is slidably mounted on the body 10 of the sample tube 6 and fixedly attached to the conduit in the port 4 to prevent the flow of product through the port between the sample tube 6 and the conduit and permit the rotational and longitudinal movement of the sample tube 6. The sample tube 6 is preferably disposed in the product conduit 2 at an angle relative to the conduit 2 in a direction opposed to the direction of product flow through said conduit 2. The plane of the opening of the inlet end 8 of the sample tube 6 is preferably constructed so that the plane of said opening is rotatable to a position substantially perpendicular to the direction of said product flow. By so constructing the inlet end 8 of the sample tube 6 and disposing the tube 6 within the conduit 2 at an angle as described above, the sample tube can be rotated to control the rate of product feed into the sample tube 6 ad the product feed will not be required to move along a 90° angled pathway to be removed from the conduit 2. By so decreasing the angle at which the product moves when traveling from the conduit 2 through the sample tube 6 the amount of abrasion on the product particle is reduced. Where the product particles comprise material that is readily broken and abraded and where the product is moving at relatively high velocities, recovery along pathways that require the material to move through angles of less than 90° is particularly important when it is desired to obtain a representative sample.

The sample tube 6 is also slidably mounted relative to the packing means 12 and the conduit in order that the inlet end 8 of said tube 6 is movable between a first position at which said inlet end 8 is positioned within the conduit 2 at a higher elevation than the longitudinal axis and a second position at which the inlet end 8 is positioned substantially tangent to a lower wall 14 of the conduit 2. By so constructing the apparatus, the inlet end 8 of the sample tube 6 can be moved relative to the flowing product to obtain product samples across a vertical cross section of the product and thereby obtain a representative composite sample. This feature is particularly important where the product tends to gradate during movement through the conduit 2.

FIG. 2 shows another embodiment of the sample tube 6 wherein said tube 6 comprises composite telescoping first and second tube members 16,18 with sample sealing means 20 therebetween. In this embodiment the inlet end 8 of the sample tube can be contracted and extended relative to the longitudinal axis of the conduit 2 without moving other portions 18, 22, 30 of the apparatus.

An elongated receiver 22, shown in FIG. 1, has a chamber 24 with an inlet end portion 26 and an outlet end portion 28 with a holding rib 29 formed on the outer periphery of said second end portion 28.

A conduit means such as, for example, a union 30 and associated piping or a swivel is connected on one end of the outlet end portion 11 of the sample tube 8 and at the other end to the inlet end portion 26 of the receiver 22. A valve 32 is installed on the conduit means. By so constructing the receiver and conveying means, a sample package can be detachably maintained on the outlet end portion 28 of the receiver by the holding rib, product discharging from the sample tube 6 is directed by the receiver 22 into the sample package while the conduit means maintains the receiver 22 in a vertical position for more uniformly filling the packages by gravity and decreasing the abrasion of the product.

In the operation of the apparatus of this invention, the opening of the inlet end 8 of the sample tube 6 is rotated manually, for example, to position said opening at a desired angle relative to the direction of product flow for controlling the rate of product sample removal. Valve 32 is then opened and product flows through the apparatus at the preselected rate and into a sample package positioned on the receiver 22. When the flow of product from the conduit 2 is not longer desired, the opening of the inlet end 8 of the tube can be rotated toward the direction of the product flow or the valve 32 can be closed. The inlet end 8 of the sample tube 6 can be moved within the conduit to obtain product from various positions across the flow path.

Other modifications and alterations of this invention will become apparent to those skilled in the art from the foregoing discussion and accompanying drawing, and it should be understood that this invention is not to be unduly limited thereto.

What I claim is:

1. An apparatus for removing a sample of product flowing through a substantially horizontal product conduit having a longitudinal axis, a lower portion, and a sampling port formed through the lower portion of the conduit, comprising:

an elongated sample tube having an inlet end within the product conduit, a body extending through the port, and an outlet end spaced from the conduit, said inlet end being open on an angle relative to a perpendicular plane through a longitudinal axis of the tube and said sample tube being rotatable about its longitudinal axis and movable relative to the conduit for positioning the inlet end at various positions relative to the longitudinal axis of the conduit in the pathway of product flowing through the conduit for removing product sample from said various positions within the conduit;

means for preventing the flow of product through the port between the sample tube and the conduit and permitting rotational and longitudinal movement of said sample tube; and

means for directing product into and maintaining a sampling package.

2. An apparatus, as set forth in claim 1, wherein the sample tube is disposed in the product conduit at an angle relative to the conduit in a direction opposed to the direction of product flow through said conduit and a plane of the opening of the inlet end is rotatable to a position substantially perpendicular to the direction of said product flow.

3. An apparatus as set forth in claim 1, including an elongated receiver having a chamber with an inlet end portion and an outlet end portion with a holding rib formed on the outer periphery of the outlet end portion for maintaining a sample package and directing product into the package; and

means connected to the second end of the sample tube and the first end of the receiver for passing product from the sample tube into the chamber of the receiver and maintaining the receiver in a vertical position.

4. An apparatus, as set forth in claim 1, wherein the inlet end of the sample tube is slidably movable relative to the conduit between a first position at which the inlet end is positioned at a higher elevation than the longitudinal axis of the conduit and a second position at which the inlet end is positioned substantially tangent to a lower wall of the conduit.