United States Patent [19]

Stone

[11] **3,895,534**

[45] **July 22, 1975**

[54] **AUTOMATIC LIQUID SAMPLING DEVISE**

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[22] Filed: **June 3, 1974**

[21] Appl. No.: **476,110**

[52] **U.S. Cl.** ..... **73/422 R**

[51] **Int. Cl.** **G01n 1/14**

[58] **Field of Search** ..... 73/421 R, 421 B, 422 R, 73/422 TC

[56] **References Cited**

UNITED STATES PATENTS

1,873,010	8/1932	Mitton	73/422 TC
2,648,225	8/1953	Hemmens	73/422 R
2,872,818	2/1959	Johnson	73/421 B

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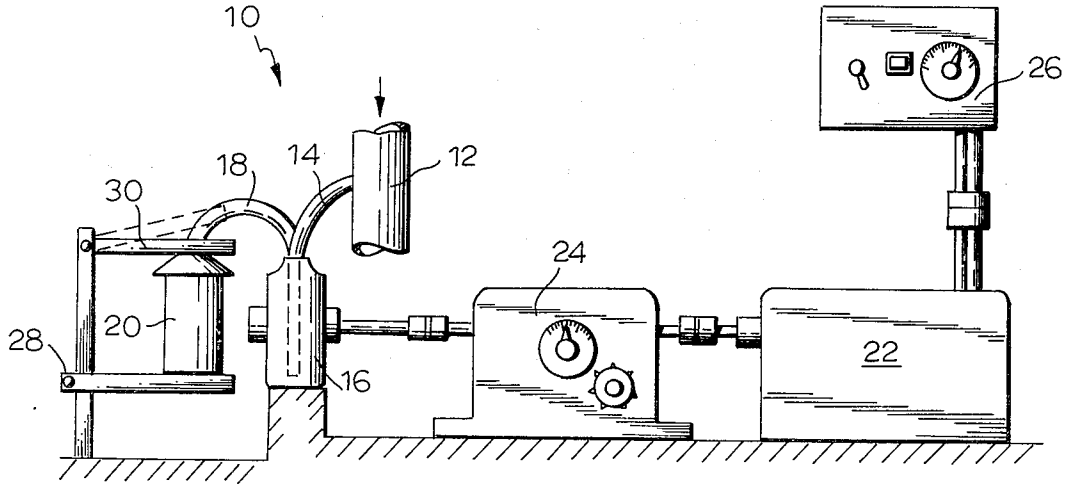
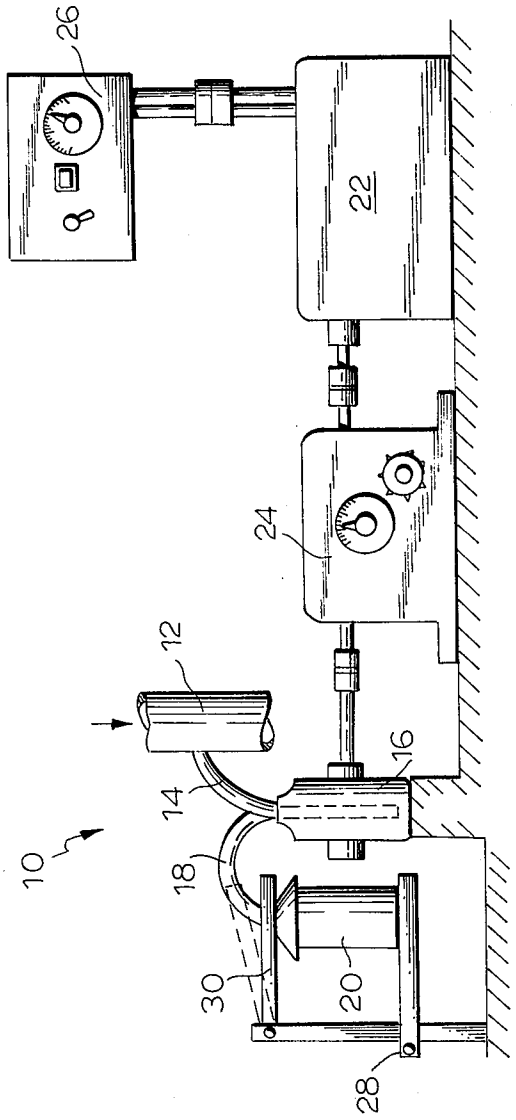
Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

An automatic milk sampling device for readily continuously extracting a proportional milk sample from a supply being transferred is disclosed. A pump having a transfer volume proportional to its rate of operation is coupled to a main loading conduit and to a sample container. The pump is driven by a variable speed motor which is, in turn, coupled to a motor speed control element. Since the operator can accurately estimate the volume being transferred, and since both the sample pump rate and a main transfer pump rate are known, the sample pump can be adjusted so as to extract a predetermined sample volume over the length of time required to transfer the milk. The control element is appropriately calibrated in terms of gallons being transferred so that the operator merely is required to adjust the control element to correspond to his estimate.

4 Claims, 1 Drawing Figure

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AUTOMATIC LIQUID SAMPLING DEVISE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a sampling system and, more particularly, to an automatic milk sampling device.

2. Description of the Prior Art

Sampling systems are well-known in the art and various procedures have been disclosed for sampling a flow of material. Examples of general sampling systems include U.S. Pat. Nos. 2,370,260 and 3,250,130. These sampling systems disclose various mechanisms by which a fluid sample can be collected. The prior art devices, however, are not particularly adapted for use when simultaneously transferring a fluid supply through a main duct and continuously sampling the fluid in order to collect a specific fluid volume during the time required for the fluid transfer. Various prior attempts have been made, more particularly, to sample milk as it is being collected in a milk truck. This prior art is exemplified by U.S. Pat. No. 3,113,598. Such systems, also, lack flexibility and cannot be automatically set to collect a specified sample volume simultaneously with the transfer of the milk to the truck and the like, regardless of the amount of milk being transferred.

SUMMARY OF THE INVENTION

It is an object of the subject invention to provide a new and improved automatic milk sampling device wherein a specific sample volume may be automatically collected during the transfer of milk or a simliar fluid to a truck or the like, regardless of the total volume being transferred, and uniformly over the entire transfer period.

It is another object of the subject invention to provide a new and improved automatic milk sampling device wherein the sample volume drawn off during the transferring process may be adjusted to produce any desired sample volume during the fluid transfer process.

These objects are achieved by the system of the subject invention including the provision of a motor speed control calibrated to correspond with the total amount being transferred and which controls the sampling system, whereby the rate at which the sample is withdrawn is controlled to coincide with the estimated time period required to transfer fluid. Moreover, means is provided for adjusting the sample volume which will be collected during the transfer operation.

BRIEF DESCRIPTION OF THE DRAWING

The FIGURE is a schematic diagram illustrating a milk collecting device of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the FIGURE, the subject invention is generally indicated by reference numeral **10.** Milk or a simliar fluid is transferred to a truck or other storage means through a main loading conduit **12.** A sampling tube **14** extends into the loading conduit and is coupled to a pump means **16** for removing sampled fluid from the main conduit **12.** The means **16** communicates, via a conduit **18,** with a sample container **20.** In this manner, the fluid sample is transferred from the conduit **12** to the sample container **20** via the pump **16** and the associated transfer conduits. Conduits **14** and **18** have been shown as if they were individual elements. The pump means **16,** however, is preferably a peristaltic pump which, as known to those skilled in the art, uses a roller on tubing. Under these circumstances, conduits **14** and **18** may comprise a unitary conduit.

The sample container **20** is supported on an adjustable container shelf **28** which is utilized to accommodate containers of varying heights. A pivoted dust cover **30** is coupled to the shelf **28** and centers the container on the shelf while protecting the sample from contamination by foreign matter. The conduit **18** preferably extends through the dust cover **30** for communication with the sample container **20.**

It is desirable to continuously extract a sample of a given size during the entire time interval in order to provide a most representative sample.

To achieve this goal, a variable speed motor **22** is coupled to the pump means **16** via an optional adjustable speed reducer **24.** The pump means **16** withdraws fluid from the main conduit **12** at a rate which is directly proportional to the speed at which the pump means is driven. Thus, by adjusting the speed of the variable speed motor **22,** the fluid volume withdrawn over a given period can be appropriately adjusted in order to withdraw a predetermined total sample volume during the fluid transfer process.

More specifically, reference numeral **26** indicates a motor speed control means. The control means is utilized to adjust the speed of the motor **22** so that the sampling system will continuously operate during the transferring process and will provide a specific predetermined sample volume at the end of the transferring operation. The operator performing the transfer, such as the driver of a milk truck, will know, with the reasonable accuracy, the total amount of milk being transferred. Since the pump used to transfer the milk operates at a reasonably constant speed, with a resulting constant flow rate, the time required to pump any specified gallonage may be readily ascertained. For example, a 50 gal./min. pump will transfer 200 gallons in 4 minutes and 2,000 gallons in 40 minutes.

The peristaltic pump **16** has a fixed rate of displacement, and consequently a given sample size requires a fixed number of revolutions of the pump. By way of example, if a sample pump processes 0.8cc/revolution and if a sample volume of 300 cc. is to be collected, the pump must be rotated a total of 375 revolutions during the loading period to provide a uniform sample. For intervals of 4 and 40 minutes, the required motor speeds are 93.8 and 9.38 RPM, respectively. By means of the variable speed motor control means, the operating speed of the motor can be adjusted in order for the pump to operate during the estimated transfer period. If the control means is calibrated in terms of gallons being transferred, which the operator can usually accurately estimate, the operation can be accomplished without computations on the part of the operator. In the above example, the operator would set the control means to 200 and 2000 gallons, respectively.

The adjustable speed reducer **24** is optionally interposed if it is desirable to adjust the amount of sample taken for specific tests. The necessity of the speed reducer under such circumstances should be apparent from the above examples, since the motor control means **26** is calibrated based on a specific sample volume. A reducer with settings ranging between 1.0 and 0.1 would allow sample volumes, which are collected

in the sample container **20**, to be varied between, for example, 300 cc. and 30 cc.

Each of the elements shown in the FIGURE is well-known in the art, and detailed embodiments thereof are thus omitted for conciseness.

It should be apparent that there are many variations which can be incorporated into the above disclosed invention. These should be considered as being within the scope of the invention and within the scope of the appended claims.

What is claimed is:

1. An automatic milk sampling device for readily continuously extracting a proportional sample of milk from a supply being transferred to a milk truck and the like, said device synchronized to operate over the entire time period required for transfer to produce a predetermined sample volume comprising:

a variable speed motor;

a sample container;

pump means connected between a main milk loading conduit and said sample container for drawing a sample from said main milk loading conduit and storing the milk sample in said sample container, said pump means having a pump rate directly proportional to the rate of operation thereof, said variable speed motor being operatively coupled to said pump means for operation thereof at a rate proportional to the rate of operation of said variable speed motor; and

a motor speed control means coupled to said variable speed motor for controlling the rate of operation thereof, said motor speed control means adjustable to vary the rate of operation of said variable speed motor for driving said pump at a rate to collect a predetermined fixed sample volume over the time required for the milk transfer operation, said speed control means being calibrated to indicate the total amount of milk being transferred as estimated by an operator, the speed of said motor being correspondingly controlled, whereby the rate of operation of said pump means may be adjusted to collect a fixed amount of sample over the time period required for transferring the milk.

2. The automatic milk sampling device of claim **1** wherein said pump means is a peristaltic pump.

3. The automatic milk sampling device of claim **2** further comprising an adjustable speed reducer interposed between said variable speed motor and said peristaltic pump and coupled thereto, said adjustable speed reducer being adjustable, depending on the volume of the sample being collected.

4. The device of claim **3** further comprising an adjustable shelf, said sample container being positioned on said shelf, a dust cover pivotally coupled to said shelf for covering said sample container, said pump communicating with said container through said dust cover.

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