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(71) Applicant(s):

TERRA WATER SYSTEMS LIMITED

Co. Kildare

Ireland

(72) Inventor(s):

PADRAIG HENNESSY

THOMAS HENNESSY

(74) Agent and/or Address for Service:

Cruickshank

8A Sandyford Business Centre

Sandyford

Dublin 18

Ireland

(54) Dosing System for Precision Automated Delivery of Feed Supplements to Livestock

(57) A dosing system (1) for delivering feed supplements to livestock has a water feed line (2) connecting between a water supply, such as a water reservoir tank (15) and a livestock drinking trough (3). A water meter is mounted in the water feed line (2) for measuring the volume of water delivered through the water feed line (2). A controller (5) is connected to the water meter and is operable to measure the rate of water consumption. A number of livestock feed supplement reservoirs (6) which contain any desired supplements for livestock are connected to the water feed line (2) via dosing pumps, for delivery of desired quantities of each required supplement into the water in the water feed line (2). Each dosing pump is connected to the controller (5) which regulates operation of the dosing pump, controlling injection of the supplements into the water feed line (2). An injection manifold in the water feed line (2) has a number of injection valves associated with the dosing pumps to inject and evenly mix the supplements with the water supplied through the water feed line (2) prior to delivery of the water to the livestock drinking trough (3).

<Figure 3>

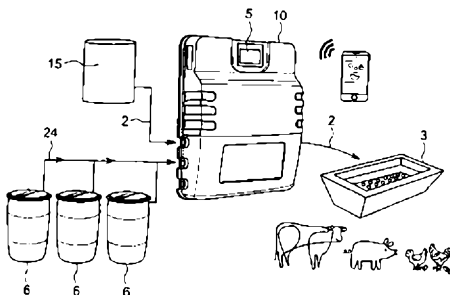


FIG. 3

**“Dosing System for Precision Automated Delivery
of Feed Supplements to Livestock”**

Introduction

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This invention relates to a dosing system for precision automated delivery of feed supplements to livestock.

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Delivery of feed supplements, such as minerals, to livestock is desirable for the improved health and welfare of the animals. In a commonly used dosing system a set amount of a liquid supplement per litre is delivered into the livestock water supply. However, it is very difficult to ensure the livestock receive the optimum amount of supplement using this proportional dosing system. This can lead to either over or under supplementation resulting in costly waste for the farmer as such supplements can be relatively expensive, and incorrect dosing may also have a detrimental effect on the health of the animals. The system is also time consuming to operate for the farmer.

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The present invention is directed towards overcoming these problems.

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WO 2015/160241 discloses an animal shed system which is able to identify each individual animal in a herd and feed a particular customised composition of feed to that particular animal. Preferably concentrated feed is delivered to each individual animal according to a personalised recipe determined for that animal via feed in a feeding trough when the animal is observed and identified at the feed trough.

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However, if a particular animal avoids a feeding trough the required concentrated feed is delivered to the specified animal in drinking water at a watering device when the animal is sensed and identified at the watering device.

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WO 01/67853 discloses a system in which each animal is identified and if necessary medicated via drinking water at a water basin when the animal is identified at the water basin. All the required medication is delivered to the water basin when the animal starts to drink to try to ensure all the water containing medication is consumed by the animal when it starts to drink.

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AU 2016/00699 discloses a system for dispensing minerals and liquid supplements

10/08/2021

directly into a livestock water supply using a peristaltic pump.

Summary of the Invention

5 According to the invention there is provided a dosing system for precision automated delivery of feed supplements to livestock, the dosing system comprising:

a water feed line for connection between a water supply and a livestock drinking trough;

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a water meter mounted in the water feed line for measuring the volume of water delivered through the water feed line;

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the water meter being connected to a controller, the controller operable to measure the rate of water consumption;

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at least one livestock feed supplement reservoir, the livestock feed supplement reservoir being connected to the water feed line by supplement delivery means which is operatively connected to the controller to control the rate of delivery of supplement from the livestock feed supplement reservoir into the water feed line; and

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means for mixing the livestock feed supplement and the water prior to delivery to the livestock drinking trough.

Preferably the mixing means is an injection manifold mounted in the water feed line.

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In one embodiment this dosing system includes a dosing pump associated with each livestock feed supplement reservoir, each dosing pump having an inlet connected to the associated livestock feed supplement reservoir and an outlet connected to an associated injection valve mounted on the injection manifold for separate injection of each livestock feed supplement through the injection manifold into the water feed line.

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In another embodiment a non-return valve is mounted at a feed water inlet of the manifold.

11/05/2020

In another embodiment the controller is operable to measure the daily water consumption of the livestock herd and to regulate injection of the required daily amount of livestock feed supplement for the herd each day into the water feed line for delivery of said herd daily amount of livestock feed to the drinking trough during delivery of the measured daily water consumption amount to the drinking trough.

In one embodiment of the invention the controller is operable to deliver the livestock feed supplement into the water feed line at a rate which is proportional to the measured livestock drinking water consumption rate.

In another embodiment of the invention the controller measures the daily livestock water consumption, and the controller is operable to evenly deliver a desired daily livestock supplement quantity throughout the daily quantity of water delivered to the livestock drinking trough.

In another embodiment of the invention the controller has an associated timer and the controller is operable to deliver the livestock supplement into the water feed line at preset intervals throughout the day.

In another embodiment the controller, the water meter, the injection manifold and each dosing pump are mounted together on a back plate within a housing.

In another embodiment the supplement delivery means comprises a dosing pump.

Brief Description of the Drawings

The invention will be more clearly understood by the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic illustration of a dosing system according to the invention;

Fig. 2 is a detail elevational view of portion of the dosing system; and

Fig. 3 is another schematic illustration of the dosing system in use.

Detailed Description of the Preferred Embodiments

5 Referring to the drawings, there is illustrated a dosing system indicated generally by the reference numeral 1 for delivering feed supplements to livestock. A water feed line 2 connects between a water supply, which may be a mains water supply, a well or water reservoir tank 15 for example, and a livestock drinking trough 3. In the embodiment shown three water feed lines 2 are provided for delivery of drinking
10 water to different drinking troughs 3, only one of which is shown in Fig. 3.

A water meter 4 is mounted in each water feed line 2 for measuring the volume of water delivered through the water feed line 2. A controller 5 is connected to each water meter 4 and is operable to measure the rate of water consumption.

15 A number of livestock feed supplement reservoirs 6 which contain any desired supplements for livestock and which in this case contain desired minerals such as magnesium and phosphorus for example, are connected to each water feed line 2 by supplement delivery means, which comprises a separate supplement feed line
20 24 from which livestock feed supplement reservoir 6 to an associated dosing pump 7, for delivery of desired quantities of each required supplement separately into the water in the water feed line 2. Each dosing pump 7 is connected to the controller 5 which regulates operation of the dosing pump 7, controlling injection of each supplement into each water feed line 2.

25 An injection manifold 8 in each water feed line 2 has a number of injection valves 9 associated with the dosing pumps 7 to separately inject and evenly mix the supplements with the water supplied through the water feed line 2 prior to delivery of the water to the livestock drinking trough 3. Each dosing pump 7 has an inlet
30 connected to the associated livestock feed reservoir 6 and an outlet connected to an associated injection valve 9 mounted on the injection manifold 8 for separate injection of each livestock feed supplement through the injection manifold 8 into the water feed line 2.

35 Each water meter 4 is connected to the controller 5 which monitors water flow to the

livestock and alters the concentration of supplements being injected into the associated water feed line 2. The supplements are injected through the injection valves 9 into the water feed line 2 by the dosing pumps 7 which are also controlled by the controller 5. Depending on water consumption supplement concentrations are increased or decreased to ensure the livestock gets an even and consistently accurate daily dose of the desired supplements.

A non-return valve 12 is mounted at a feed water inlet 20 of the injection manifold 8. A feed water outlet 21 of the injection manifold 8 connects via the feed water line 2 with the trough 3.

The controller 5, dosing pumps 7, and injection manifolds 8 with injection valves 9, water meters 4 and non-return valves 12 can conveniently be mounted within a housing 10, assembled on a rigid back plate 11 which incorporates each manifold 8 where the supplements are injected and non-return valves 12 which prevent the back flow of supplements. A detachable cover 14 is mounted on the back plate 11.

In use, the controller 5 measures the daily rate of water consumption through each water feed line 2. The controller 5 will then operate the dosing pumps 7 to deliver a desired daily quantity of one or more of the supplements into the water supply accurately and evenly throughout the daily supply of feed water to the livestock drinking trough 3.

The controller 5 is operable to measure the daily water consumption of the livestock herd and to regulate injection of the required daily amount of livestock feed supplement for the herd each day into the water feed line 2 for delivery of the herd daily amount of livestock feed to the drinking trough 3 during delivery of the measured daily water consumption amount to the drinking trough 3.

The system of the invention allows dosing a defined amount of required supplement into a variable water flow on a herd average.

It will be appreciated that the system of the invention removes the variability of water consumption. It gives accuracy and flexibility of dosing on a farm, allowing pumps to be controlled via timers, and using advanced algorithms to ensure

accuracy of dosing. It provides precision dosing of liquid supplements irrespective of water consumption. This means that animals only receive an exact daily dose metered per animal and irrespective of water consumption. All of the daily water intake information, dosing information and tank levels can be communicated via the cloud using IOT communication. This provides improved control, reduced labour and increased health benefits for the livestock.

The system allows monitoring of water flow to animals and alteration of the concentration of minerals being injected into the water feed line. Depending on water consumption mineral concentrations are increased or decreased to ensure animals get an even, consistent and accurate daily dose of the required minerals. Advantageously the key components are mounted together on the backplate so it is easy to install into existing animal drinking systems, simply connecting the water supply and supplement reservoirs.

Any desired supplements can be delivered into the drinking water by the system of the invention.

In the specification the terms "comprise, comprises, comprised and comprising" or any variation thereof and the terms "include, includes, included and including" or any variation thereof are considered to be totally interchangeable and they should all be afforded the widest possible interpretation and vice versa.

The invention is not limited to the embodiments hereinbefore described which may be varied in both construction and detail within the scope of the appended claims.

CLAIMS

1. A dosing system (1) for delivering feed supplements to a livestock herd, the dosing system comprising:

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a water feed line (2) for connection between a water supply (15) and a livestock drinking trough (3);

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a water meter (4) mounted in the water feed line (2) for measuring the volume of water delivered through the water feed line (2);

the water meter (4) being connected to a controller (5), the controller (5) operable to measure the rate of water consumption;

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at least one livestock feed supplement reservoir (6), the livestock feed supplement reservoir (6) being connected to the water feed line (2) by supplement delivery means (7, 8, 9) which is operatively connected to the controller (5) to control the rate of delivery of supplement from the livestock feed supplement reservoir (6) into the water feed line (2); and

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an injection manifold (8) mounted in the water feed line (2) for mixing the livestock feed supplement and the water prior to delivery to the livestock drinking trough (3).

25

2. The dosing system (1) as claimed in claim 1 comprising a dosing pump associated with each livestock feed supplement reservoir, each dosing pump having an inlet connected to the associated livestock feed supplement reservoir and an outlet connected to an associated injection valve mounted on the injection manifold for separate injection of each livestock feed supplement through the injection manifold into the water feed line (2).

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3. The dosing system as claimed in claim 1 or claim 2 when a non-return valve is mounted at a feed water inlet of the manifold (8).

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11/05/2020

4. The dosing system as claimed in any one of the preceding claim wherein the controller, the water meter, the injection manifold and each dosing pump are mounted together on a backplate within a housing.
- 5
5. The dosing system as claimed in any preceding claim wherein the invention the controller is operable to deliver the livestock feed supplement into the water feed line at a rate which is proportional to the measured livestock drinking water consumption rate.
- 10
6. The dosing system as claimed in any preceding claim wherein the controller measures the daily livestock water consumption and is operable to evenly mix a desired daily livestock supplement quantity throughout the daily quantity of water delivered to the livestock drinking trough.
- 15
7. The dosing system as claimed in any preceding claim, wherein the controller has an associated timer and the controller is operable to deliver the livestock supplement into the water feed line at preset intervals.
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8. The dosing system as claimed in any one of the preceding claims wherein the controller is operable to measure the daily water consumption of the livestock herd and to regulate injection of the required daily amount of livestock feed supplement for the herd each day into the water feed line for delivery of said herd daily amount of livestock feed to the drinking trough during delivery of the
- 25
- measured daily water consumption amount to the drinking trough.

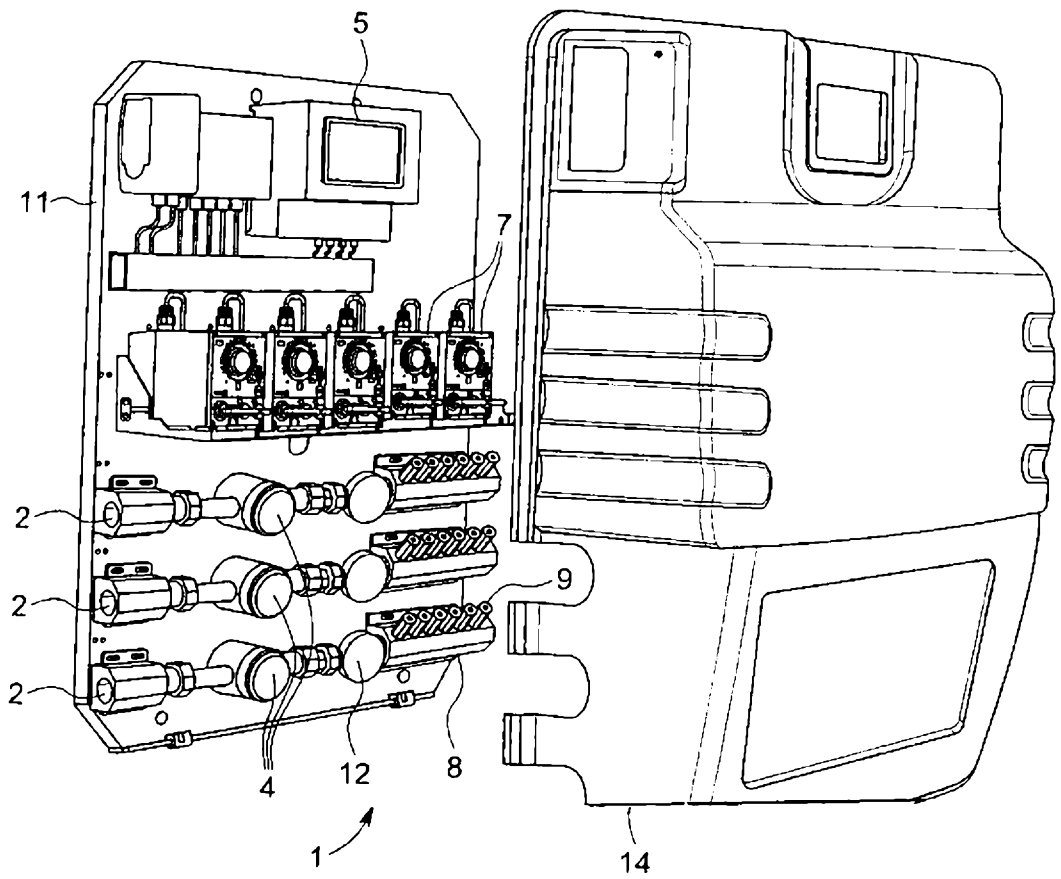


FIG. 1

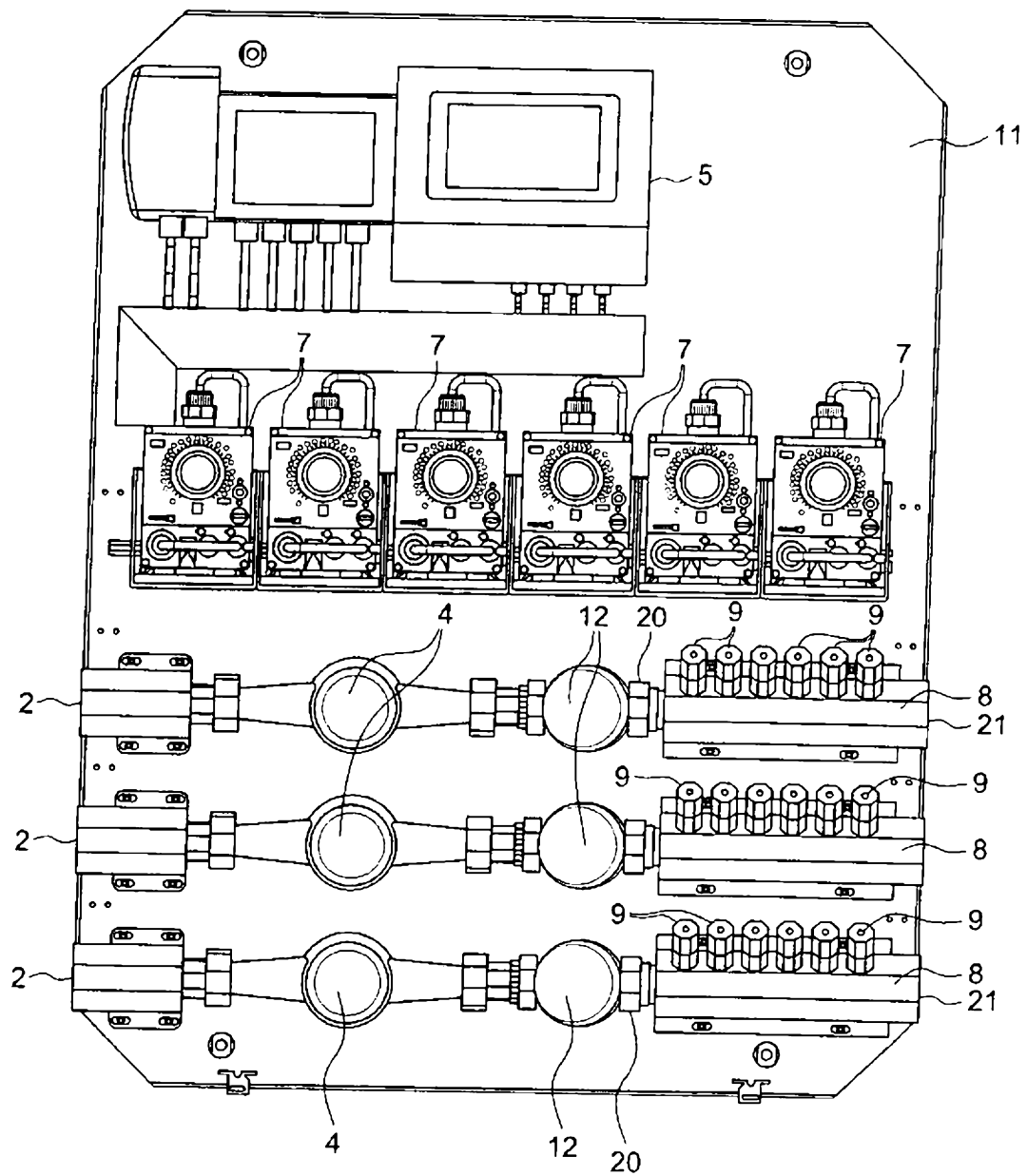


FIG. 2

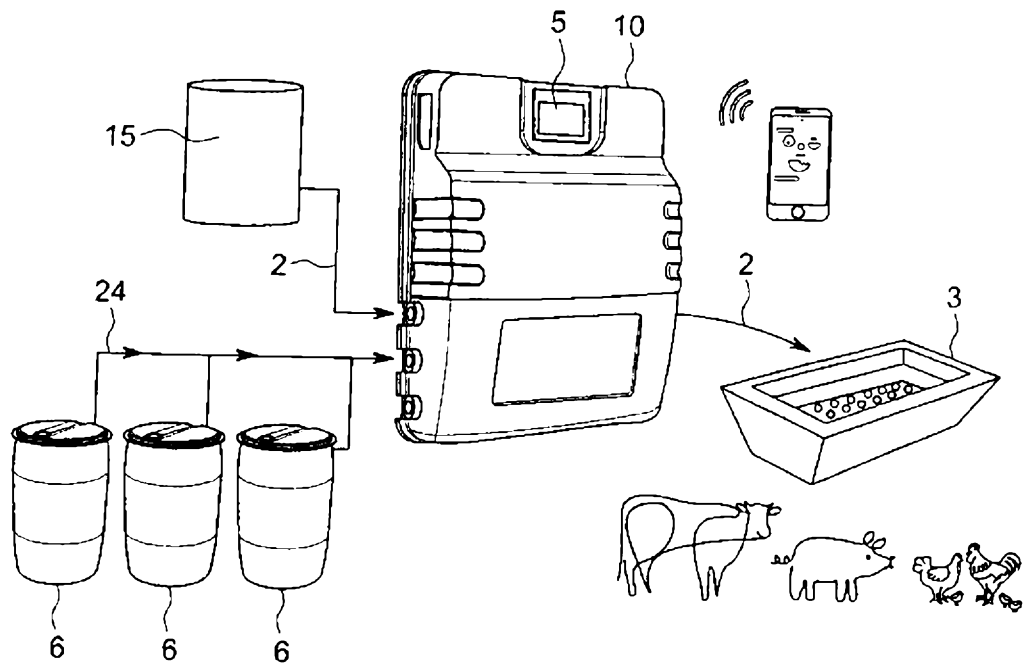


FIG. 3