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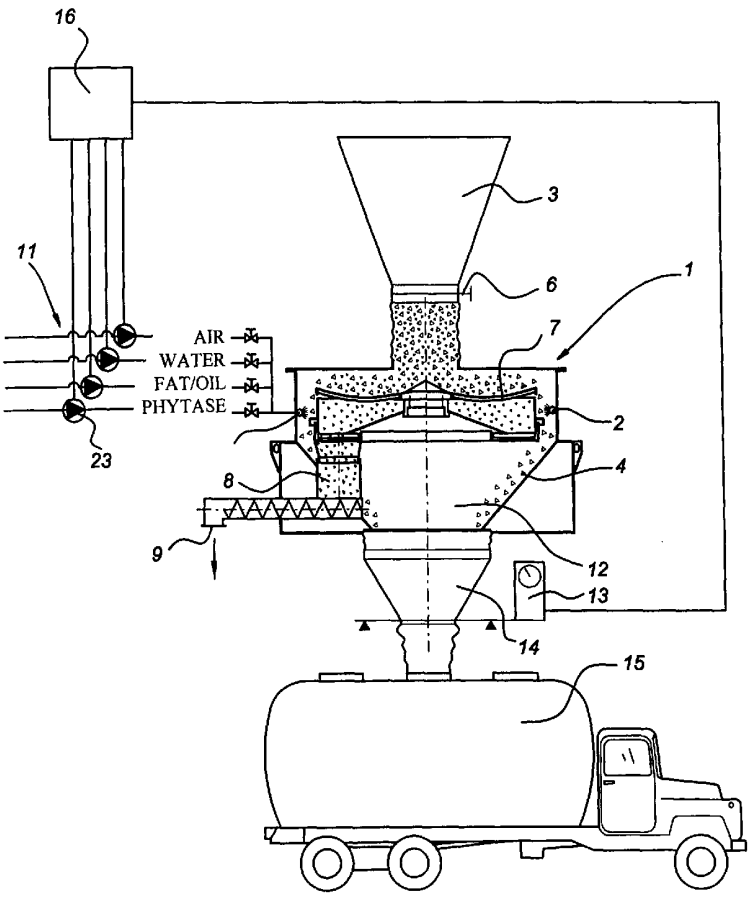
(54) Title: APPARATUS AND METHOD FOR DOSING A LIQUID



(57) Abstract: The invention relates to a method and installation (1) for metering a fluid, comprising at least one tube (17) and at least one helical mixing blade (18), located in the tube, for mixing the fluid to be metered. The helical mixing blade can be perforated in order to prevent demixing of the fluid. The installation is positioned close to a discharge side of a sieve (7) in order to make use of the disseminated discharge of the product (4) to be sprayed.

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APPARATUS AND METHOD FOR DOSING A LIQUID

The invention relates to a method and installation for applying a fluid to a granular product.

Installations of this type are known in the state of the art. In food products, such as cattle feeds, additives are frequently added in the form of fats or enzymes. The fats increase the energy value of the food product and the enzymes ensure better digestion of the food products and reduction of the emission of, for example, phosphates.

It is known from the prior art that additives in pulverulent form are admixed to the raw materials for a food product before the production process. As a result the product composition is already fixed in an early stage and can no longer be modified at the time of delivery to the end user.

A disadvantage of the installations from the prior art is that the quality of the product is adversely affected by the addition of fats and enzymes before the start of the production process. The product may not be subjected to prolonged heating during the production process since otherwise damage occurs to the enzymes and similar substances. This is problematical in particular in the case of pelleting, where temperatures above 70°C are used.

An additional disadvantage of adding the additives dry lies in metering of the additives. Metering by means of admixing additives before the start of the production process is a fairly inaccurate process. Some of the additives added are not formed into product and are returned as raw material via the pulverulent waste discharge of the installation.

One disadvantage of an installation according to the prior art with which additives are applied in the wet state to the granular product is demixing of a mixture or suspension, such as a fluid/enzyme mixture, before the mixture is applied to the product. This also results in the consistent quality of the product being adversely affected.

One aim of the invention is to provide an installation which makes it possible to add additives to products after the production process is complete, so that a product composition can be adjusted to specific requirements of the end user at the time of delivery. A further aim of the invention is to provide an installation which makes it possible for additives to be able to be applied in liquid form.

A further aim of the invention is to provide an installation which distributes liquid additives well over the finished product.

The aims are achieved in that the product is fed from a storage container to a distribution device, in which distribution device the granules are positioned a mutual distance apart and are fed past an edge of the distribution device, over which the granules drop in a layer thickness of at most a few granules, a fluid metering device being positioned close to the edge of the distribution device and applying fluid to the granules located close to the edge.

The distribution device is, for example, a sieve, preferably a rotary sieve or a vibratory sieve. At the edge of such a sieve the granules drop off this sieve in a layer thickness of at most a few granules. The sieving device separates the granules from the pulverulent waste that is produced during the production process. The device for metering a fluid is preferably located downstream of such a sieving device. The product is well distributed when the granules flow off the sieve deck and good distribution of the fluid over the product is achieved.

A mixture of air, water, fat, oil or another fluid with an additive, for example, enzymes such as phytase, is fed to the metering device by means of feed lines. According to the invention this metering device consists of a tube line which is provided with one or more spray nozzles, which tube line is provided with a helical mixing blade that acts as a static mixer. This helical mixing blade comprises at least two mixing strips positioned some distance apart. A gap is accommodated between the two strips, through which gap the mixture to be metered is able to flow. In a further embodiment the helical mixing blade comprises at least a narrow helical strip and a broad helical strip. The two strips are positioned some distance apart, so that there is a gap between the two plates through which mixture is able to flow.

The helical mixing blade can also be provided with perforations. The use of perforations prevents demixing of the mixture of air, water, fat, oil or another fluid with an additive.

In one embodiment the invention is provided with a control unit which receives a signal that is emitted by a weighing device, which measures the quantity of product ejected. Depending on the signal emitted by the weighing device, before metering of the fluid the control unit will switch on or switch off the installation or switch to a cleaning position, in which latter position the installation is sprayed clean by means of compressed air or the

like, to prevent the installation becoming contaminated by metering fluid into an empty installation.

In another embodiment the invention is provided with a ammeter on the drive motor of the sieving device. The current consumption of the drive motor of the sieving device increases when the latter is filled. Depending on the signal emitted by the ammeter, before metering fluid the control device switches on or off or switches to a cleaning position.

The tube lines are preferably composed of segments of a length of approximately one metre. This makes it possible easily to position the helical plate strips in a defined position in the tube without deformation thereof occurring on introduction. The direction of these helical plate strips can differ per segment. Thus, the helical plate strips can be positioned one after the other first in one pitch and then in the opposing pitch. An alternation of one pitch and the opposing pitch provides more turbulence in the tube line and better mixing between the ingredients of the mixture.

As a result of the velocity that the fluid has in the longitudinal direction of the tube line, a vertical velocity component is produced by the fluid flowing against the mixing strips. This set of velocity components ensures good mixing of the fluid in the tube line.

The invention will be explained below with reference to the illustrative embodiment shown in the drawing. In the drawing:

Fig. 1 shows a view of a metering device according to the invention; and

Fig. 2 shows an exposed view of the tube line provided with a helical mixing blade according to the present invention.

Figure 1 shows an overview of a feed installation for pellets, provided with a metering device 2 according to the invention. Pellets 4 flow from the storage silo 3 via a pneumatic slider 6 to a rotary sieve 7. On the rotary sieve 7 the pellets 4 are flung towards the outer edge of the sieve 7 as a consequence of the centrifugal force which arises. At the outer edge the pellets 4 drop off the rotary sieve 7 individually, as an essentially single layer of separate granules. The pulverulent waste 8, that drops through the holes in the sieve, is recycled to the process by means of a pulverulent waste discharge 9 for re-use.

At the location where the pellets 4 drop off the rotary sieve 7, the pellets 4 are well distributed over the entire periphery of the rotary sieve 7. A ring line 2, which supplies a mixture of fat, oil or water and enzymes, for example phytase, by means of pumps 23 in feed lines 11, is positioned just below the periphery of the sieve 7. Spray nozzles 5 are fixed to this ring line 2, which spray nozzles atomise the mixture over the well-distributed

quantity of pellets 4 dropping from the sieve 7. What is achieved by the use of a helical mixing blade 18 in the ring line 2 is that the mixture to be sprayed is always well mixed. The helical mixing blade 18 in the ring line 2 acts as an efficient static mixer.

The pellets 4 sprayed with the mixture are collected in a buffer 12, which is provided with a weighing device 13. This weighing device 13 emits a signal to a control unit 16 that is used to control the pumps 23 of the metering device 2. Feed line 11 for the ring line 2 can be sprayed clean using air or the like. The latter takes place when virtually all the desired batch from the silo 3 (for example 1 to 2 tonnes) has been dispensed into the hopper 14 and the quantity of pellets 4 dropping onto the weighing device 13 decreases as a result. The trailing stream of the pellets 4 takes up the final amount of the mixture dispensed by the metering device, whilst after the final quantity of pellets 4 air is sprayed in order to spray clean the feed lines 11 and the ring line 2. Spraying with mixture when there are no longer any pellets 4 in the installation is prevented.

From the weighing device 13 a specific quantity of pellets 4 is discharged via the hopper 14 into a bulk transporter 15, which takes the pellets 4 to customers.

Figure 2 shows an exposed view of the tube line 17 provided with a helical mixing blade 18 according to the present invention. The tube line 17 is an elongated, thin-walled structure of circular cross-section. The helix 18 comprises two mixing strips 19, 21 positioned an even distance apart. The two strips 19, 21 are of the same size in the widthwise direction and the width of the mixing strips 19, 21 is equal to the diameter of the tube line 17. A gap 22 is provided between the mixing strips 19, 21. As a result of the velocity that the fluid has in the longitudinal direction of the tube line 17, a vertical velocity component is produced by the fluid flowing against the mixing strips 19, 21. This set of velocity components ensures good mixing of the fluid in the tube line 17.

The method and installation according to the invention are not restricted to pellets but can be used for other granular products, such as washing powders and any other granular product to which an additive in fluid form is applied.

Claims

1. Method for applying a fluid to a granular product (4), characterised in that the product is fed from a storage container (3) to a distribution device (7), in which distribution device (7) the granules (4) are positioned a mutual distance apart and are fed past an edge of the distribution device, over which the granules (4) drop in a layer thickness of at most a few granules, a fluid metering device (2) being positioned close to the edge of the distribution device (7) and applying fluid to the granules (4) located close to the edge.

2. Method according to Claim 1, characterised in that the distribution device (7) comprises a sieving device (7).

3. Method according to Claim 2, characterised in that the sieving device (7) comprises a rotary sieving device, the granular product (4) dropping over a peripheral edge of the rotary sieving device.

4. Method according to Claim 2, characterised in that the sieving device (7) comprises a linear sieving device, the granular product (4) dropping over a peripheral edge of the linear sieving device.

5. Method according to one of the preceding claims, characterised in that the granular product comprises pellets (4).

6. Method according to Claim 1, 2, 3 or 4, characterised in that the granular product comprises granules.

7. Method according to one of the preceding claims, characterised in that after passing the distribution device (7) the granular product (4) is collected in a collector (14), the weight of which is determined by a weighing device (13), the fluid metering device (2) being operated depending on the weight determined.

8. Method according to one of the preceding claims, characterised in that the fluid metering device (2) comprises a static mixer to which fluid and an active substance are fed.

9. Installation for applying a fluid to a granular product (4), comprising a storage container (3) and a distribution device (7) for collecting product discharged from the storage container (3), characterised in that the distribution device (7) is provided with an edge over which the granular product is fed, the granules (4) being a mutual distance apart in a layer thickness of at most a few granules, a fluid metering device (2) being positioned close to the edge of the distribution device (7) for applying fluid to the granules located close to the edge.

10. Installation according to Claim 9, characterised in that the distribution device (7) comprises a sieving device.

11. Installation according to Claim 10, characterised in that the sieving device (7) comprises a rotary sieving device, the granular product (4) dropping over a peripheral edge of the rotary sieving device.

12. Installation according to Claim 9, 10 or 11, characterised in that the fluid metering device (2) comprises a line (17), positioned around the edge of the distribution device (7), having a tube and a helical mixing blade (18) located in the tube, and at least two spray nozzles (5) located a mutual distance apart and connected to an opening in the tube wall.

13. Installation according to Claim 12, characterised in that the helical mixing blade (18) is provided with a perforation.

14. Installation according to Claim 12 or 13, characterised in that the spray nozzles (5) are directly joined to the tube wall.

15. Installation according to Claim 12, 13 or 14, characterised in that the helical mixing blade (18) comprises two helical mixing strips (19, 21) connected to one another and positioned some distance apart.

16. Installation according to Claims 12 - 15, characterised in that the edge of the distribution device is essentially circular and the line comprises a ring line located around the peripheral edge.

17. Installation according to one of Claims 9 to 16, characterised in that the installation is provided with a collector (14) for collecting the product dispensed by the distribution device (7), a weighing device (13) that is connected to the collector, and a control unit (16) having an input connected to the weighing device and having an output connected to the metering device (2) for operating the fluid metering device depending on the weight determined.

18. Static mixer comprising a tube and a helical mixing blade (18) that is made from a plate strip and is fixed in the tube.

19. Static mixer according to Claim 18, characterised in that the helical mixing blade (18) is provided with a perforation.

20. Static mixer according to Claim 18 or 19, characterised in that the mixing blade (18) comprises two helical strips (19, 21) located some distance (22) apart which are connected to one another at ends.

21. Static mixer according to Claims 18 - 20, characterised in that a spray nozzle (5) is fitted in the tube wall.

Fig 1

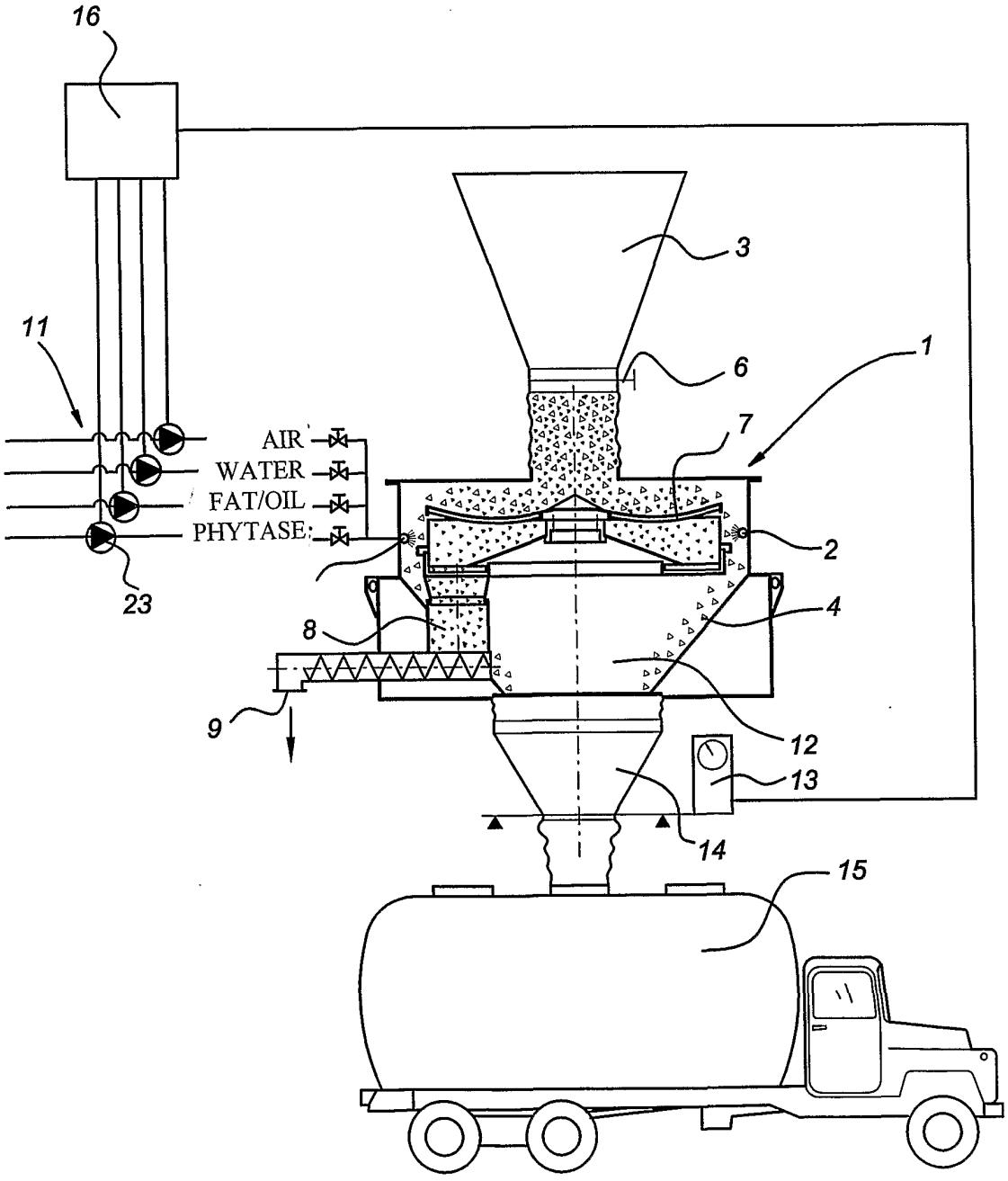
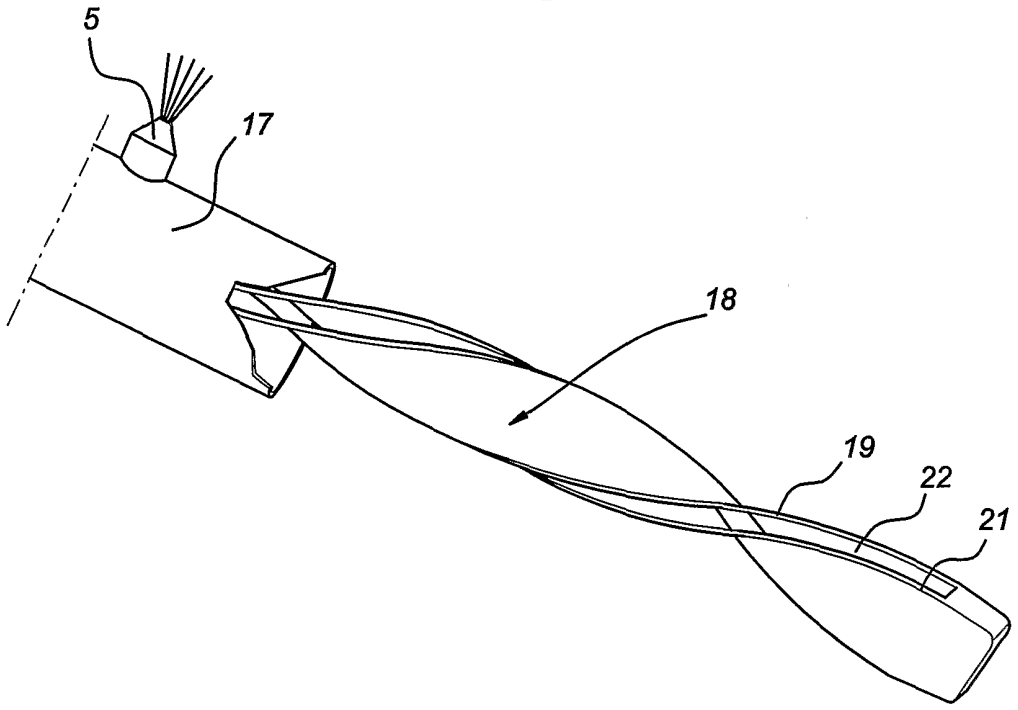


Fig 2



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Inter nal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
2 January 2002	14/01/2002

Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

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