Fig. 3
Improvements in or relation to feed boxes

Field of the Invention
The present invention concerns improvements in or relation to a feed box of the kind indicated in the preamble of claim 1.

Background of the Invention
Many prior art feed boxes of this kind are designed with a predominantly cylindrical container part that often includes a transparent container part - if the container is not made entirely of transparent material - such that the actual amount of feed content in the actual feed box/feed position always can readily be ascertained.

The container part is usually connected upwardly with an endless tube conveyor supplying feed to the feed box from a feed station. The container part is downwards designed with a funnel-shaped part with a discharge valve which e.g. includes a spherical valve body.

The spherical valve body is frequently operatively connected with a common control wire running along the tube conveyor such that the common control wire can operate one or more rows of feed boxes/feed positions.

A common problem with existing feed boxes is the difficult in minimizing the portions of feedstuff discharged to specific feed positions or specific animals.

DE19953 107 is relevant to the person skilled in the art by disclosing a feed box being supplied from a feedstuff station through a supply opening.

However the person skilled in the art may want to improve the possibilities of individually managing a reduced dosage in a simple way.
Object of the Invention

It is the object of the invention to indicate an improved feed box of this type, and which by means of very simple technical means can achieve a significantly improved operation of feed boxes of this type.

Description of the Invention

An object is achieved by a feed box of the kind that e.g. via one or more supply openings supply feedstuff portions from a feedstuff station via an endless tube conveyor serving a plurality of preferably uniform feed boxes in a livestock stable, the feed box being provided with a lower discharge opening which via one or more down pipes is connected to a feeding position of one or more livestock, such as pigs, the discharge opening including a valve body, which is operatively connected with a common control wire running along an upper end of the feed box.

The feed box may further be provided with a control device adapted for either allowing the operative connection with the common control wire to open the discharge opening by lifting the valve body, or to prevent the operative connection with the common control wire from opening the discharge opening by lifting the valve body.

Thereby is improved the possibilities of individually managing a reduced dosage in a simple way.

In an aspect an outlet from a vertical supply channel for feedstuff is situated at a lower interior bottom part of the feed box in the vicinity of the discharge opening.

Thereby a limited dosage of feedstuff may be applied since the dosage may be limited by the location of the upper edge of the outlet.

In an aspect the valve body is provided with a number of radial wing parts, which divides a lower interior bottom part of the feed box in the vicinity of said discharge opening.

Thereby a limited dosage of feedstuff that is otherwise applied in the lower interior bottom part may further be limited or measured. Hence the feed box may be config-
ured to provide individually measured quantities that are finely partitioned for small quantities.

In an aspect the control device comprises a release wire or cord with a free end connected with an actuation handle outside at one side of the feed box and arranged to assume two positions, namely a lower position corresponding to the valve body being actively connected with the common control wire, and an upper position corresponding to the valve body not being in active connection with the common control wire, i.e. an actuation pull in the common control wire will not act on the thus uncoupled valve body.

In this aspect the feed box may be configured to function either coupled or uncoupled with the valve body. At the same time the feed box may, when coupled, be configurable to deliver individually measured quantities even at small quantities. At least the configuration allows for great flexibility. The valve body with wings may even be aligned to block feedstuff or aligned to allow feedstuff to enter the lower interior bottom part as if there were no wings.

In an aspect the vertical supply channel for feedstuff has an outlet that is adjustable in size. The outlet may extend above the lower interior bottom part of the feed box.

When the outlet extends above the lower interior bottom part, feedstuff may be filled in larger quantities. With the wings only provided in the lower interior bottom part, the feed box may function to deliver large quantities of feedstuff.

Thus the feed box disclosed has in a simple way multiple functions and will at the same time be able to deliver large quantities when the outlet is large and extends upwards, smaller quantities when the outlet is in the lower interior bottom part, and even smaller quantities when the wings on the valve is aligned to partition the lower interior bottom part.

The feed box according to the invention is special in that said valve body is provided with a number of radial wing parts which divides a lower interior bottom part of the feed box in the vicinity of said discharge opening.
By simple mechanical means is hereby achieved an improved feed box of the type indicated in the introduction, with very significant improvements in use. In other words it is hereby obtained a significant improved possibility to minimizing the portions of feedstuff discharge through said discharge opening.

Appropriately, the feed box according to the invention may be such provided that outer edges of said wings parts have shapes complementary to that of exterior wall parts of said lower interior bottom part of the feed box.

Preferably, the feed box according to the invention may be such provided that said valve body is provided with two radial wing parts which are positioned along a transverse centre line of the valve body, the latter being pear-shaped.

Alternatively, the feed box according to the invention may be such provided that said valve body is provided with three radial wing parts, two of which are positioned along a transverse centre line of the valve body, while the third wing part is positioned midways to said two radial wing parts at the rear side of the valve body - as seen from a supply channel for feedstuff.

**Description of the Drawing**

The invention is explained more closely in the following with reference to the drawing, on which:

Fig. 1 shows a perspective view of an embodiment of a feed box according to the invention,

Fig. 2 shows a sectional view of the feed box shown in Fig. 1 and partly filled with feedstuff delivered via an endless tube conveyor,

Fig. 3 shows a perspective view of the feed box cf. Fig. 1 with a partial cut-out in bottom front part for illustrating a new and improved pear-shaped valve body having radial wing parts,
Fig. 4A shows a plane side view of a preferred pear-shaped valve body having radial wing parts - as seen from the edge of the radial wing parts.

Fig. 4B shows another plane side view of the preferred pear-shaped valve body cf. Fig. 4A - as seen towards the radial wing parts.

Fig. 4C shows a perspective view of the preferred pear-shaped valve body shown in Figs. 4A and 4B, and

Fig. 4D shows a plane view of the pear-shaped valve body with radial wings - as seen from above.

**Detailed Description of the Invention**

The feed box 2 shown in Figs. 1-3 is adapted for being upwardly connected to an endless tube conveyor 4 by means of brackets 6 such that the feed box 2 is suspended under the tube conveyor 4 and is supplied with feed from the tube conveyor 4 via an upper supply opening 8 and vertical supply and channel 9.

The channel 9 has an outlet 11 at a lower interior part 9 or lower funnel-shaped part 9 of the feed box 2.

At the bottom, the feed box 2 is connected with a feed position by a not shown down pipe connected with a lower discharge opening 10 which is formed in a lower funnel-shaped part 12 of the feed box 2 such that a valve seat 14 for a downwardly spherical valve body 16 is formed at the transition between the funnel-shaped part 12 and the discharge opening 10.

The valve body 16 is upwardly provided with an eyelet 18 through which a flexible release wire or cord 20 is extending, of which one end is running upwards and connected with a common control wire running through the stable along the tube conveyor 4 and operating one or more rows of feed boxes 2.

The opposite free end of the release wire or cord 20 is connected with an actuation handle 24 outside at one side of the feed box 2 and arranged to assume two positions,
namely a lower position 26 corresponding to the valve body 16 being actively connected with the common control wire, and an upper position 28 corresponding to the valve body 16 not being in active connection with the common control wire, i.e. an actuation pull in the common control wire will not act on the thus uncoupled valve body 16. The feed box 2 in question is thus disconnected from the common control wire as the connection between the former and the valve body 16 is extended in that the actuation handle 24 is disposed in the upper position 28.

The actuation handle 24 thus has an alternative function as the handle 24 can be released from the lower position 26 and moved manually downwards in order to lift the valve body 16, whereby an amount of feed can be dosed to a certain feed position, e.g. with the object of calming the animal or animals in the actual feed position.

As indicated in Figs. 2 and 3 the pear-shaped valve body 16 is provided with a number of radial wing parts 30 which divides said lower funnel-shaped bottom part 12 of the feed box 2 in the vicinity of said discharge opening 10.

By very simple technical or mechanical means is hereby obtained that feedstuff inlet from the supply channel 9 by means of said radial wing parts 30 is prevented also to fill up the opposite part of said lower funnel-shaped bottom part 12. In other words hereby is obtained an improved possibility of minimizing the amount of feedstuff being inlet through said vertical supply channel 9.

In practice the normal amount of about 1.6 litres hereby may be reduced by about 0.2 litres to an amount of about 1.4 litres corresponding to a reduction or saving of about 12.5 % of each portion of feedstuff delivered to each feeding positions. In the end such a saving of about 12.5 % may be considered very important - as seen from an economic point of view.

On the other hand the reduction of some 0.2 litres would also be considered important as seen from a point of view regarding the animal welfare of a sow in the period of time just before farrowing - where it may be important not to give the sow to large portions of feedstuff.
Figs. 4A-4D show how - by way of example - a pear-shaped valve body 16 being provided with radial wing parts 30, where the outer edges 32 have an inclined configuration complementary to that of the interior walls of said lower funnel-shaped bottom part 12 in the vicinity of said discharge valve 10. In practice the thickness of the radial wing parts 30 is about 2.5 mm - as the wing parts 30 is produced as integrated parts of the pear-shaped valve body 16 which preferably is made by injection moulding from a suitable plastic material such as polypropylene (PP).

As stated in dependent claim 4 the valve body, which preferable is pear-shaped, may be provided with more than two radial wing parts 30, namely with a third radial wing part (not shown) being positioned in a midway position between said first radial wing parts 30 at the rear side opposite to said supply channel 9.

Finally, it should be mentioned that in practice the shape of said valve body 16 may vary from a ball-shape to a pear-shape or a similar valve body - which, however, being provided with a number of radial wing parts the outer edges of which being configured complementary to that of the interior walls of the lower bottom part 12 of the feed box 2.

Preferably, said valve body being provided with at least two radial wing parts - but the number of wing parts may vary and also the positions of the radial wing parts may vary in dependence of the grain size of actual used feedstuff.

In practice the number and the positions of said radial wing parts may support optimal function of the valve body by preventing the latter from overturning inside the lower bottom part 12 of the feed box 2.

Therefore, it is of course very important that the shape and the position of the radial wing parts of the valve body in practice are suitable to support the wanted effect namely to prevent admittance of the feedstuff to the rear side of valve body in order to fulfil the purpose of the present invention and to be able to minimize the supply of feedstuff to said feeding positions.
Reference numbers of the drawing:

2    feed box
4    endless tube conveyor
6    brackets
5    upper supply opening
8    vertical supply channel
9    lower discharge opening
10   outlet
12   lower funnel-shaped part
14   valve seat
16   valve body
18   upper eyelet
20   release wire or cord
22   common activation cord or wire
26   lower active position
28   upper inactive position
30   radial wing parts
32   outer edges of wing parts
CLAIMS

1. A feed box (2) of the kind that e.g. via one or more supply openings (8) supply feedstuff portions from a feedstuff station via an endless tube conveyor (4) serving a plurality of preferably uniform feed boxes in a livestock stable, the feed box (2) being provided with a lower discharge opening (10) which via one or more down pipes is connected to a feeding position of one or more livestock, preferably pigs, the discharge opening (10) including a valve body (16) which is operatively connected with a common control wire (22) running along an upper end of the feed box (2), wherein the feed box (2) is provided with a control device adapted for either allowing the operative connection with the common control wire (22) to open the discharge opening (10) by lifting the valve body (16), or to prevent the operative connection with the common control wire (22) from opening the discharge opening (10) by lifting the valve body (16).

2. Feed box (2) according to claim 1, characterised in that an outlet (11) from a vertical supply channel (9) for feedstuff is situated at a lower interior bottom part (12) of the feed box (2) in the vicinity of the discharge opening (10).

3. Feed box (2) according to claim 1 or 2 characterised in that said valve body (16) is provided with a number of radial wing parts (30), which divides a lower interior bottom part (12) of the feed box (2) in the vicinity of said discharge opening (10).

4. Feed box (2) according to one or more of claims 1 to 3, characterised in that the control device comprises a release wire or cord (20) with a free end connected with an actuation handle (24) outside at one side of the feed box (2) and arranged to assume two positions, namely a lower position (26) corresponding to the valve body (16) being actively connected with the common control wire (22), and an upper position (28) corresponding to the valve body (16) not being in active connection with the common control wire, i.e. an actuation pull in the common control wire will not act on the thus uncoupled valve body (16).
5. Feed box (2) according to one or more of claims 2 to 4, **characterised in** that the outlet (11) of the vertical supply channel (9) is adjustable in size, and which outlet may extend above the lower interior bottom part (12) of the feed box (2).

6. Feed box (2) according to one or more of claims 3 to 5, **characterised in** that outer edges (32) of said wings parts (30) have shapes complementary to that of exterior wall parts of said lower interior bottom part (12) of the feed box (2).

7. Feed box (2) according one or more of claims 3 to 6, **characterised in** that said valve body (16) is provided with two radial wing parts (30) which are positioned along a transverse centre line of the valve body (16), the latter being pear-shaped.

8. Feed box (2) according one or more of claims 3 to 6, **characterised in** that said valve body (16) is provided with three radial wing parts (30) two of which are positioned along a transverse centre line of the valve body (16), while the third wing part is positioned midways to said two radial wing parts (30) at the rear side of the valve body (16) - as seen from a supply channel (9) for feedstuff.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
A01K 5/02 (2006.01), A01K 39/01 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. MINIMUM DOCUMENTATION SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

CPC/iPC: A01K; UCLA: 119

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

DK, NO, SE, FI: Classes as above.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.

P. A WO 2015 197073 A1 (DALTEC AS) 2015-12-30, see esp. abstract, claims 1 and 2, figure 12B, page 5, line 33 to page 6, line 5 and page 8, lines 9-12. 5

A DE 19953107 B4 (NIKLAUS et al.) 2006-02-09, see esp. paragraphs [0012], [0013], [0024], [0029] and the figures. 1-4, 6-8

A US 3211339 A (PIPER et al.) 1965-10-12, see esp. figure 3 and column 3, lines 41-61. 5

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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:
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