There is disclosed a spreader unit (20) for distributing bales (5) of feed material from a bale feeding device (10). The spreader unit (20) comprises a first elongate spreader member (22) mounted to said feeding device (10) and positionable to engage with a first surface of an advancing bale (5). A second elongate spreader member (24) is also mounted to the feeding device (10) and positionable to engage with a second surface of the advancing bale (5). The first elongate spreader member (22) and the second elongate spreader member (24) have a plurality of projections (22b, 24b) formed thereon. Each of the projections (22b, 24b) are configured to extend into the respective first or second surface of the bale (5) to facilitate separation of (the bale into smaller, more consistent pieces, as the bale (5) advances.
SPREADER MECHANISM WITH TWO ELONGATE SPREADER MEMBERS HAVING PROJECTIONS

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority from Australian Provisional Patent Application No. 2009900682 filed on 18 February 2009 (the contents of which are incorporated herein by reference.

J-IhLU Ob' INVENTION

This invention relates to a device for feeding livestock, and in particular, to a device for distributing baled feed material to livestock in an automatic manner.

BACKGROUND ART

Conventionally, feed for livestock such as hay, silage or other stock feed material is generally prepared and stored in the form of round or square/rectangular bales. Such bales are typically stored in barns, fields or hay stacks for later feeding to the livestock to supplement their dietary intake.

Traditional methods of feeding such bales involve dispensing the bales on an individual basis. In this regard, the bales are typically manually loaded onto vehicles, such as utility vehicles, pick-ups, trucks and the like and manually dispensed from the vehicle. Bales may be dispensed at predetermined intervals to provide a number of feeding sites for the livestock to access and feed on the bales. Any breakage of the bales into smaller pieces is also typically done manually prior to dispensing the bales from the truck. As the bales are often quite large and heavy, and tightly bound together with string, dispensing baled feed material can be very tiresome and labour intensive task, requiring a number of workers to perform the task. Due to the manual nature of the task and the involvement of machinery, there is much potential for workplace injury for individuals handling the bales.

A number of mechanically operated feeders have been proposed to assist in transporting and dispensing baled feed material from the feeder. The feed material is typically dispensed onto a ground surface for the livestock to feed on. Many of these devices involve various complicated mechanical structures and machinery that dispense the bales by way of sliding or tilting movements of a variety of moving parts. Apart from being complicated and prone to mechanical problems, other disadvantages with such feeders is that they are typically dedicated towards unloading individual bales of feed material. As such, following dispensing of the individual bales it is often necessary to re-load the feeder. In addition, where bales are bound together with twine
or string, there is typically no provision for safely and automatically removing and handling the string other than manually removing the string and separately storing it for disposal or reuse. Hence, the presence of loose pieces of string around the feeder device can result in the string becoming entangled in the machinery of the feeder as the bales are being unloaded. This can cause temporary or permanent failure of the feeding equipment/machinery resulting in an increase in cost and time to the farmer/primary producer. Similarly, the string can become dispensed with the baled feed material and may be consumed by the livestock, creating potential health problems for the livestock.

The present applicants International Patent Application No. PCT/AU2007/001040, which is incorporated herein by reference, describes one type of feeding device for automatically dispensing bales from a platform to a ground surface. Whilst such a device has proven successful in providing a less labour intensive and complex means for feeding livestock from bales of feedstuff, the distribution and evenness of the amount of feed material being dispensed may vary. In some instances, depending upon the manner in which the bale is formed and the type of feed material present the baled form, the bales may break up into inconsistently large pieces rather than form a consistent and constant trail of feed material behind the device. Hence, some animals, particularly those who are "shy feeders", may be restricted from accessing the larger pieces of dispensed feed material due to the presence of larger and more dominant animals in the herd. Such a problem with inconsistent food distribution can cause large variations in animal growth and can cause excessive food wastage in a pasture situation.

Accordingly, there is a need to provide a device that provides a more evenly spread distribution of feed material from a feeding device to the livestock.

The above references to and descriptions of prior proposals or products are not intended to be, and are not to be construed as, statements or admissions of common general knowledge in the art. In particular, the above prior art discussion does not relate to what is commonly or well known by the person skilled in the art, but assists in the understanding of the inventive step of the present invention of which the identification of pertinent prior art proposals is but one part.

**Invention**

Accordingly, in one aspect of the invention there is provided a spreader unit for distributing bales of feed material from a bale feeding device comprising:

- a first elongate spreader member mounted to said feeding device and
positionable to engage with a first surface of an advancing bale; and

a second elongate spreader member mounted to said feeding device and
positionable to engage with a second surface of the advancing bale;

wherein, the first elongate spreader member and the second elongate spreader member have a plurality of projections formed thereon, each of the projections are configured to extend into the respective first or second surface of the bale to facilitate separation of the bale as the bale advances.

In one embodiment, the first spreader member is mountable to a post provided on the feeding device. The post may extend substantially vertically with respect to the direction of travel of the advancing bale. The first elongate spreader member may extend substantially horizontally from said post and may be positionable to engage with an upper surface of the bale as the bale advances. The first elongate spreader member may be free to rotate about its longitudinal axis such that, as the bale advances, the first elongate spreader member may roll over the upper surface of the advancing bale.

The second elongate spreader member may extend substantially horizontally from the post and may be mountable to the post below the first elongate spreader member to engage with an undersurface of the bale as the bale advances. The second elongate spreader member may be free to rotate about its longitudinal axis such that as the bale advances the second elongate spreader member may roll over the undersurface of the advancing bale.

The first elongate spreader member may be movably mounted to the post such that the vertical position of the first elongate spreader member may be adjustable with respect the position of the second elongate spreader member. Such an arrangement may accommodate for a variation in the size of bales being processed by the bale feeding device.

The first and second spreader members may comprise elongate tubular members configured to freely rotate about a longitudinal axis. The plurality of projections may be blades or wings arranged to extend radially from the elongate tubular members. The projections may be arranged in at least two regions along the length of the tubular members. Each of the projections located in each region may be substantially equispaced about the periphery of the respective tubular member. As the first and second elongate spreader members roll over the upper surface and the undersurface respectively of the advancing bale, the projections may extend into the advancing bale to grip and separate the bale into smaller pieces of feed material.
According to a second aspect of the present invention, there is provided a bale feeding
device for feeding bales of feed material to livestock, comprising:

a substantially planar body configured to support one or more bales of feed material thereon;

a pusher element operable to push one or more of the bales from the substantially planar body for consumption by the livestock; and

a spreader unit mountable to said planar body and positionable to engage with the one or more bales as each bale is being pushed by the pusher element, the spreader unit being configured to facilitate separation of the bale into smaller pieces for livestock consumption.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred features of the present invention will now be described with particular reference to the accompanying drawings. However, it is to be understood that the features illustrated in and described with reference to the drawings are not to be construed as limiting on the scope of the invention. In the drawings:

Figure 1 is a perspective view of a feeding device employing a spreader unit in accordance with an embodiment of the present invention;

Figure 2 is an end view of the feeding device of Figure 1;

Figure 3 is an isolated perspective view of the spreader device of Figures 1 and 2;

Figures 4A and 4B are plan and side views respectively of a first spreader of the spreader device of Figure 3; and

Figures 5A and 5B are plan and top views respectively of the second spreader of Figure 3.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to Figure 1, one embodiment of a spreader unit 20 in accordance with one embodiment of the present invention is shown in use with a bale feeding device 10.

The bale feeding device 10 is an automated bale feeding device 10 of the type as described in the Applicant's co-pending International Patent Application No. PCT/AU2007/001040, the contents of which are incorporated herein by reference.

It will be appreciated that whilst the spreader unit 20 of the present invention will be
described in relation to the bale feeding device 1 as described in the Applicant's earlier International Patent Application No. PCT/AU2007/00 1040, the spreader unit may be equally applied to a variety of different types of feeding devices that feed bales of feed material for consumption by livestock, and still fall within the spirit of the present invention.

Referring to Figure 1, the feeding device 10 is incorporated into a trailer or tray of a truck 2. The tray of the truck 2 provides a substantially planar body 11 upon which a plurality of bales 5 are loaded for feeding therefrom. The body 12 of the device 10 is arranged to define a pair of chutes 13 that extend longitudinally along a length of the body 12. Whilst only one chute 13 is shown having a plurality of bales loaded therein, each chute 13 may be loaded with bales 5 prior to use of the device such that lie bales 5 of that chute 13 are dispensed therefrom during use.

To assist in dispensing the bales from each chute 13, a pusher element 14 is provided in the surface of the body 12. The pusher element 14 is longitudinally moveable along a length of the body 12, from a proximal end of the body 12, as is shown in Figure 1, to a distal end of the body 12. The pusher element 14 has an arm member 15 that extends behind the most proximal bale located in the chute 14. In this regard, movement of the pusher element 14 towards the distal end of the body 12 causes the bales 5 to be pushed of the distal end of the body 12, in the manner as shown. In the embodiment as shown in Figure 1, the pusher element 14 is received in a groove 16 provided along a central region of the body 12 and is moved along the groove 16 by way of a cable 17 connected to bi-directional winch (not shown). By controlling the winch, the direction and speed of pusher element 14 is controlled, thus controlling the rate in which the bales are dispensed from the distal end of the body 12. It will be appreciated that other motive means may be provided to control movement of the pusher element 14, and still fall within the scope of the present invention.

It will be appreciated that merely pushing the bales 5 from the distal end of the body 12 will result in the bales breaking up in an ad-hoc manner as they fall towards the ground. Such a means of breaking up the bales may result in an uneven distribution of feed material with the feed material being presented to the livestock in clumps or groups rather than in an evenly distributed trail behind the feeding device 10. A problem with such an uneven distribution of feed material is that in a group-feeding situation, some livestock may eat more of the feed material than others. "Shy feeders" may be less able to access the feed material with the larger animals dominating the area of feed distribution. For this reason, the food should be more evenly distributed to ensure that all animals have access to the feed material. As such, the bale 5 should be broken into more evenly sized biscuits that extend in a trail behind the device 10 for consumption.
by the livestock.

Kor this reason, and as is shown in Figure 1, spreader unit 20 of the present invention is provided to extend across one or both of the chutes 13 so as to act on the bale 5 as it is being dispensed from the distal end thereof.

The spreader unit 20 is shown in more detail in Figures 2 and 3. A vertical post 21 is mounted to an end of the body 12, adjacent the central region thereof, as shown. A first or upper spreader 22 is mounted to the post 21 so as to extend substantially horizontally therefrom, and is movably located with respect to the post 21. A sleeve 22a is provided to extend over the post 21 and a locating screw or pin is provided in a recess therein to engage with the surface of the post 21 to secure or lock the first spreader 22 in vertical position.

A second or lower spreader 24 is mounted to a lower region of the post 21 such that it is located substantially level with, or adjacent to the distal end of the body 12 such that as the bale 5 is pushed off the distal end of the body 12 is impinges upon the second spreader 24. The second spreader 24 also extends substantially horizontally from the post 21. A frame member 25 extends from the second spreader 24 and is configured to be receive on the surface of the body 12 to provide additional support to the second spreader 24 when it is affixed to the device 10. The frame member 25 is shown as consisting of a plurality of tubular members extending substantially orthogonally from the second spreader, however it will be appreciated that other stabilising arrangements may be employed and still fall within the spirit of the present invention.

Each of the first spreader 22 and second spreader 24 is in the form of rollers that are able to freely rotate about a longitudinal axis thereof. Each spreader 22, 24 has a plurality of projections 22b, 24b respectively that extend radially therefrom. The projections 22b, 24b are in the form of blades or wings located at two distinct regions along the length of the spreaders 22, 24. The projections 22b, 24b are in the form of triangular plates or reinforced wires that extend radially from the surface of the spreaders 22, 24 in an evenly spaced manner, however other arrangements are also envisaged.

It will be appreciated that whilst the present invention is shown with the projections 22b, 24b from two spaced apart regions along the length of the spreaders 22, 24, the projections 22b, 24b, may be arranged at more than two locations where required. Further, whilst the present invention is shown having the projections 22b of the first spreader 22 located to align with the projections 24b of the second spreader 24, they may also be off-set.
the arrangement as shown in Figure 2, as the bale 5 is driven over the distal end of the body 12 by the pusher element 14, the upper surface of the bale 5 passes below the first spreader 22 and the underside of the bale 5 passes over the second spreader, causing the spreaders 22, 24 to rotate. Each of the projections 22b and 24b of the corresponding spreader 22, 24 extend into the bale 5 causing the bale to separate into even biscuits as it is dispensed from the device 10. The action of the corresponding projections 22b, 24b through the bale 5 causes breaking up of the bale 5 in a more even manner thereby greatly improving the spread of distribution of the bale 5.

As shown in Figures 4A and 4B, the first spreader 22 is mounted to the post 21 by way of sleeve 22a. The spreader 22 is in turn flexibly attached to the sleeve 22a by way of a resilient means, such as a Spring. In this regard, the spreader 22 is able to move to accommodate loads applied thereto by the bale 5 during use without placing undue stress against the post 21. In this regard, for bales varying in height, the spreader 22 is able to resiliently move in the direction of arrow A, and should the projections 22a grip the bale 5 the spreader 22 is able to resiliently move in the direction of arrow B.

Throughout the specification and claims the word "comprise" and its derivatives are intended to have an inclusive rather than exclusive meaning unless the contrary is expressly stated or the context requires otherwise. That is, the word "comprise" and its derivatives will be taken to indicate the inclusion of not only the listed components, steps or features that it directly references, but also other components, steps or features not specifically listed, unless the contrary is expressly stated or the context requires otherwise.

Orientation terms used in the specification and claims such as vertical, horizontal, top, bottom, upper and lower arc to be interpreted as relational and are based on the premise that the component, item, article, apparatus, device or instrument will usually be considered in a particular orientation, typically with the spreader unit 20 uppermost.

It will be appreciated by those skilled in the art that many modifications and variations may be made to the methods of the invention described herein without departing from the spirit and scope of the invention.
The claims defining the invention:

1. A spreader unit for distributing bales of feed material from a bale feeding device comprising:
   a first elongate spreader member mounted to said feeding device and positionable to engage with a first surface of an advancing bale; and
   a second elongate spreader member mounted to said feeding device and positionable to engage with a second surface of the advancing bale;

   wherein, the first elongate spreader member and the second elongate spreader member have a plurality of projections formed thereon, each of the projections are configured to extend into the respective first or second surface of the bale to facilitate separation of the bale as the bale advances.

2. A spreader unit according to claim 1, wherein the first elongate spreader member is mountable to a post provided on the feeding device.

3. A spreader unit according to claim 2, wherein the post extends substantially vertically with respect to the direction of travel of the advancing bale.

4. A spreader unit according to claim 3, wherein the first elongate spreader member extends substantially horizontally from said post and is positionable to engage with an upper surface of the bale as the bale advances.

5. A spreader unit according to claim 4, wherein the first elongate spreader member is free to rotate about its longitudinal axis such that as the bale advances the first elongate spreader member is caused to roll over the upper surface of the advancing bale.

6. A spreader unit according to claim 5, wherein the second elongate spreader member extends substantially horizontally from said post and is mountable to said post below said first spreader member to engage with an undersurface of the bale as the bale advances.

7. A spreader unit according to claim 6, wherein the second elongate spreader member is free to rotate about its longitudinal axis such that as the bale advances the second elongate spreader member is caused to roll over the undersurface of the advancing bale.

8. A spreader unit according to any one of the preceding claims, wherein the first
elongate spreader member is movably mounted to the post such that the vertical position of the first spreader member is adjustable with respect to the position of the second elongate spreader member.

9. A spreader unit according to any one of the preceding claims, wherein the first and second elongate spreader members comprise elongate tubular members configured to freely rotate about their longitudinal axis.

10. A spreader unit according to claim 9, wherein the plurality of projections are blades or wings arranged to project radially from the elongate tubular members.

11. A spreader unit according to claim 10, wherein the projections are arranged in at least two regions along the length of the tubular members.

12. A spreader unit according to claim 11, wherein each of the projections located in each region is substantially equispaced about the periphery of the respective tubular member.

13. A spreader unit according to any one of claims 10 to 12, wherein the first and second elongate spreader members roll over the upper surface and the undersurface respectively of the advancing bale, the projections extend into the advancing bale to grip and separate the bale into smaller pieces of feed material.

14. A bale feeding device for feeding bales of feed material to livestock, comprising:

   a substantially planar body configured to support one or more bales of feed material thereon;

   a pusher element operable to push one or more of the bales from the substantially planar body for consumption by the livestock; and

   a spreader unit mountable to said planar body and positionable to engage with the one or more bales as each bale is being pushed by the pusher element, the spreader unit being configured to facilitate separation of the bale into smaller pieces for livestock consumption.

15. A bale feeding device according to claim 14, wherein the spreader unit comprises a first elongate spreader member mounted to said feeding device and positionable to engage with a first surface of an advancing bale and a second elongate spreader member mounted to said feeding device and positionable to engage with a second surface of an advancing bale.
16. A bale feeding device according to claim 15, wherein the first elongate spreader member and the second elongate spreader member has a plurality of projections formed thereon, each of the projections being configured to extend into the respective first or second surface of the bale to facilitate separation of the bale as the bale advances.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

AOIK 5/00 (2006.01)  
AOID 90/12 (2006.01)  
AOIF 29/10 (2006.01)  
AOIF 17/02 (2006.01)  
AOIF 29/12 (2006.01)

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)

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

EPODOC, WPI, IPC A01K 5/-, A01F 29/-, A01D90/- & keywords (hay, feed) and like terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>CN 2262338 Y (PUYANG CITY AGRICULTURAL MECH (CN)) 17 September 1997. English abstract retrieved from EPODOC database Abstract</td>
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<td>X</td>
<td>DE 1929791 U (BUCHER) 23 December 1965 Figures 1 &amp; 2</td>
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Further documents are listed in the continuation of Box C

See Patent family annex

Date of the actual completion of the international search 17 March 2010

Date of mailing of the international search report 23 March 2010

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Supplemental Box
(To be used when the space in any of Boxes I to IV is not sufficient)

Continuation of Box No: III

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are different inventions as follows:

- Invention 1: Claims 1-13 are directed to a spreader unit. It is considered that the first and second elongate spreader members, each having the projections that are configured to extend into the respective first or second surface of the bale to facilitate separation of the bale as the bale advances comprises a first distinguishing feature.

- Invention 2: Claims 14-16 are directed to a bale feeding unit. It is considered that the combination of the pusher element and the spreader unit that is configured to facilitate separation of the bale into smaller pieces comprises a second distinguishing feature.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

The only feature common to all of the claims is a spreader unit which facilitates the separation of the bale. However this concept is not novel in the light of:

WO 2008/01 1678 A1 (KENNA) 31 January 2008. (see page 9, lines 24-30; figure 8)

This means that the common feature can not constitute a special technical feature within the meaning of PCT Rule 13.2, second sentence, since it makes no contribution over the prior art.

Because the common feature does not satisfy the requirement for being a special technical feature it follows that it cannot provide the necessary technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention \textit{a posteriori}.

The International Searching Authority believes that a search and examination for the second invention will not involve more than negligible additional search and examination effort over that for the first invention and so no additional search fee is required in order to search and examine that invention.
This Annex lists the known “A” publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX