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(54) Title: ROUND BALER WITH PICK-UP LIFT CONTROL

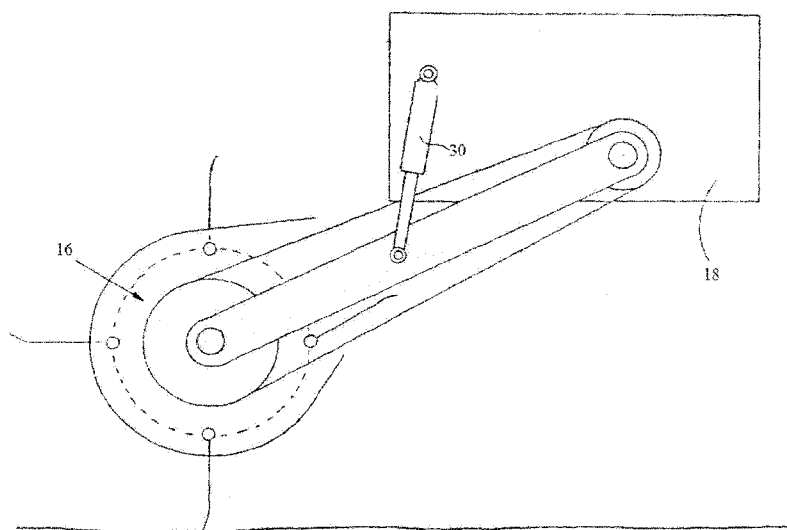


Fig 2

(57) Abstract: According to the invention, the baler (10) comprises a lifting mechanism (30) which is connected to raise the pickup (16) off the ground and thereby stop the introduction of further crop material into the baling chamber in response to a full bale signal being produced by sensor.

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ROUND BALER WITH PICK-UP LIFT CONTROL

Field of the invention

5 The present invention relates to a round baler.

Background of the invention

10 A baler is an agricultural implement that is usually towed by a tractor to pick up crop material, such as grass or straw, that has been deposited, for example by a combine harvester, in swaths or windrows on the ground, and to form the crop material into wrapped or tied bales.

15 There are two types of balers, referred to as square balers and round balers, respectively. As their names imply, square balers form rectangular blocks of square section while round balers form cylinders. In square balers, the process of forming bales is continuous and does not need to
20 be interrupted between bales. The baler can be moved continuously over the ground and a new bale can be commenced while the previously formed bale is being discharged.

25 In the case of a round baler, on the other hand, the baling needs to be stopped between bales. The baler has a single baling chamber that must be kept closed while a bale is being formed but must be opened to discharge the formed bale before the next bale can be started. During the time that a bale is being is wrapped and discharged, no fresh
30 crop material should be admitted into the baling chamber.

35 Conventionally, a round baler produces a signal when the bale that is being formed reaches a predetermined size. This full bale signal is given to the tractor driver who must then slow down and stop to allow the bale to be completed, wrapped and discharged. However, variance between the stopping behaviour of different operators can lead to

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inconsistency in the dimensions of the formed bales.
Furthermore, if an operator should fail to react to a full bale signal in a timely manner, serious damage can be caused to some components of the baler.

5

It has already been proposed in EP 1813146 to send the full bale signal to a tractor controller which is used to bring the tractor to a halt automatically. This solution, however, requires the tractor to have a controller that
10 allows it to be brought to a halt by an externally applied signal and such controllers are not to be found on all tractors, especially older ones.

Summary of the invention

15

In accordance with the present invention, there is provided a round baler having a pickup for picking up crop material from the ground and for introducing the crop material into a baling chamber within which the crop
20 material is formed into a cylindrical bale, and a sensor for producing a full bale signal when the bale being formed attains a predetermined size, characterised in that the baler further comprises a lifting mechanism which is connected to raise the pickup off the ground such that the
25 introduction of further crop material into the baling chamber is reduced or stopped in response to a full bale signal being produced by the sensor.

An advantage of the baler of the present invention is
30 that it can be towed by a conventional tractor that does not itself have a controller to permit it to be stopped or reduced sufficiently by a signal received from the baler. When towed by such a tractor, the signal to raise the pickup is generated within the baler.

35

It is, however, alternatively possible for the baler to be used with more modern tractors that have a controller

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capable of receiving and processing a signal from the baler. In this case, the full bale sensor signal may be sent to the tractor and the tractor may transmit the instruction to raise the pickup. The signal received by the tractor may additionally be used by the controller to slow down or stop the tractor while the baling processing is being completed. An important advantage of the invention in this case is that it provides a faster response because the pickup can be raised in less time than it takes for the towing tractor to stop.

If the speed of the pickup reel is variable it may suitably be controlled automatically following the production of a full bale signal by the sensor to achieve bale consistency. In an embodiment of the invention, the speed profile of the reel is controlled in dependence upon the speed of the baler and the density of the crop material.

Where the speed of the pickup reel is not variable, bale consistency can be improved by introducing a variable time delay between the time when a full bale signal is generated by the sensor and the raising of the pickup reel. The time delay may be variable to take into consideration such parameters as crop density.

Regardless of whether or not the towing tractor can be controlled by an external signal, the invention offers the advantage that no reliance need be placed on the operator to respond diligently and promptly to signals received from the full bale sensor. All the actions needed to ensure that the baling process is discontinued when the baling chamber is full can be instigated by the baler itself or, when electronic communication is possible, by the towing tractor after receiving the full bale signal from the baler.

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If the operator of the tractor were to continue driving while the pickup of the baler is raised, crop material would be left on the ground. It is therefore still desirable, when the tractor cannot be controlled by an external signal, for the baler to send to the operator the full bale signal so that the tractor may be stopped by the operator but in the invention the quality of the bales is unaffected by the operator's behaviour on receipt of the full bale signal.

10 Brief description of the drawings

The invention will now be described further, by way of example, with reference to the accompanying drawings in which:

15 Figure 1 shows a perspective view of a round baler that may be used in implementing the present invention; and

Figure 2 shows a schematic view of the pickup of the round baler in Figure 1.

20 Detailed description of the preferred embodiment

The baler 10 in the accompanying drawing is constructed as a trailer supported on an axle with ground wheels 12. At its front end, the baler 10 has a hitch 13 by means of which it is connected to a tractor and an input shaft 14 driven by the power takeoff (PTO) shaft of the tractor.

The method of operation of a round baler is very well documented in the prior art and need only to be described in the present context sufficiently to provide an understanding of the present invention.

The main components of the baler are a rotary pickup generally designated 16 with a reel that picks up crop material from the ground and feeds it into a baling chamber within a housing 18. The housing 18 has a hinged back 20 which is shown in the closed position. Crop material that

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enters the housing 18 is rolled by a series of belts 22 so that the crop material spirals into a bale. As the size of the bale increases, the geometry of the belts changes to accommodate the expansion of the bale while maintaining the crop material under compression. When the baler eventually reaches the desired size, a web is introduced into the baling chamber to wrap the bale. After the bale has been wrapped, the back 20 pivots upwards and the wrapped bale is discharged from the rear end of the housing 18.

10

Once the bale has reached its full size and wrapping has commenced, it is necessary to interrupt the introduction of crop material into the baling chamber. Hitherto, this has been achieved either by sending a signal to the tractor operator to instruct him to stop the tractor or by sending a signal directly to an electronic controller of the tractor to bring the tractor to a standstill.

Balers are already known that have a pickup that can be raised and lowered, usually by means of a lifting mechanism such as for example a hydraulic actuator. Such raising and lowering of the pickup is normally performed at headland turns. In the preferred embodiment of the invention, a full bale signal produced by a sensor (not shown) within the baling chamber is used to control the pickup 16 and regulate the introduction of crop material into the baling chamber once the bale has achieved a predetermined size.

It is possible for the full bale signal to be used only to control the raising and lowering of the pickup 16. Thus, once the wrapping process has been initiated, the pickup 16 may be raised from the ground so that no further crop material enters the baling chamber until after the formed bale has been discharged. It is preferred to introduce a time delay between the time the full bale signal is produced and the time that the pick up is raised. That time delay may be varied in dependence upon crop parameters, such as

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density, so as to ensure that a predetermined quantity of crop is admitted into the baling chamber after the full bale signal is produced by the sensor.

5 In an alternative embodiment of the invention, the speed of the pickup reel of the mechanism 16 may be varied so that the introduction of crop material is not stopped suddenly but a reduced flow of crop material is introduced into the baling chamber in the time between production of
10 the full bale signal and commencement of wrapping. Such control can achieve more consistent filling of the baling chamber as well as assisting with the wrapping.

 Thus, the full bale signal can be used to initiate a
15 sequence of steps that commence with a reduction of the speed of rotation of the pickup reel, synchronised with or followed by the initiation of the wrapping process and continuing with the raising of the pickup to halt the crop flow into the baling chamber completely. After the bale has
20 been wrapped and discharged, the pickup 16 can again be lowered and operated at its full speed to commence the next baling cycle.

 It is possible when setting the speed profile of the
25 reel of the pickup to take into account the ground speed of the baler and/or the density of the crop in order to achieve a more constant bale size and quality.

 If used with a conventional tractor, two signals may be
30 sent to the operator of the tractor. The first signal, coinciding with the full bale signal from the sensor within the baling chamber and the second coinciding with the lifting of the pickup. The first signal can now serve as advance warning to the operator that a bale wrapping cycle
35 has commenced while the second can warn the operator that no further crop is being picked up by the baler and that the tractor should be stopped. Prompt stopping is not required

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for the purpose of maintaining consistency or avoiding damage but avoids crop material being left on the ground.

5 If the towing tractor has a controller receiving electronic signals from the baler, the controller may be used to raise the pickup reel of the baler and to control the speed of the tractor.

10 The preferred embodiments of the invention offer the advantage of subjecting the operator to less stress while achieving more consistent and efficient baling of the crop material, and avoiding damage to the baler through overfilling of the baling chamber.

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CLAIMS

1. A round baler (10) having a pickup (16) for
picking up crop material from the ground and for introducing
5 the crop material into a baling chamber within which the
crop material is formed into a cylindrical bale, and a
sensor for producing a full bale signal when the bale being
formed attains a predetermined size, characterised in that
the baler (10) further comprises a lifting mechanism (30)
10 which is connected to raise the pickup (16) off the ground
such that the introduction of further crop material into the
baling chamber is reduced or stopped in response to a full
bale signal being produced by the sensor.

15 2. A round baler as claimed in claim 1, wherein the
lifting mechanism (30) is controlled by a signal generated
within the baler.

3. A round baler as claimed in claim 1, wherein the
20 lifting mechanism (30) is controlled by a signal received
from a controller aboard the towing tractor connected to
receive the full bale signal from the baler mounted sensor.

4. A round baler as claimed in any preceding claim,
25 wherein the speed of the pickup reel is variable and is
controlled following the production of a full bale signal by
the sensor in order to achieve bale consistency.

5. A round baler as claimed in claim 4, wherein the
30 speed profile of the reel is controlled in dependence upon
the speed of the baler and the density of the crop material.

6. A round baler as claimed in any preceding claim,
wherein a variable time delay is introduced between the time
35 when a full base signal is generated by the sensor and the
raising of the pickup reel.

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7. A round baler as claimed in claim 6, wherein the time delay is varied in dependence upon the density of the crop material.

5 8. A round baler as claimed in any preceding claim wherein the baler comprises means for sending the full bale signal to the operator of a tractor towing the baler to warn the operator that wrapping of a bale is about to commence.

10 9. A round baler as claimed in claim 4, wherein the baler further comprises means for sending to the operator of a tractor towing the baler a signal indicative of the lifting of the pickup.

1/2

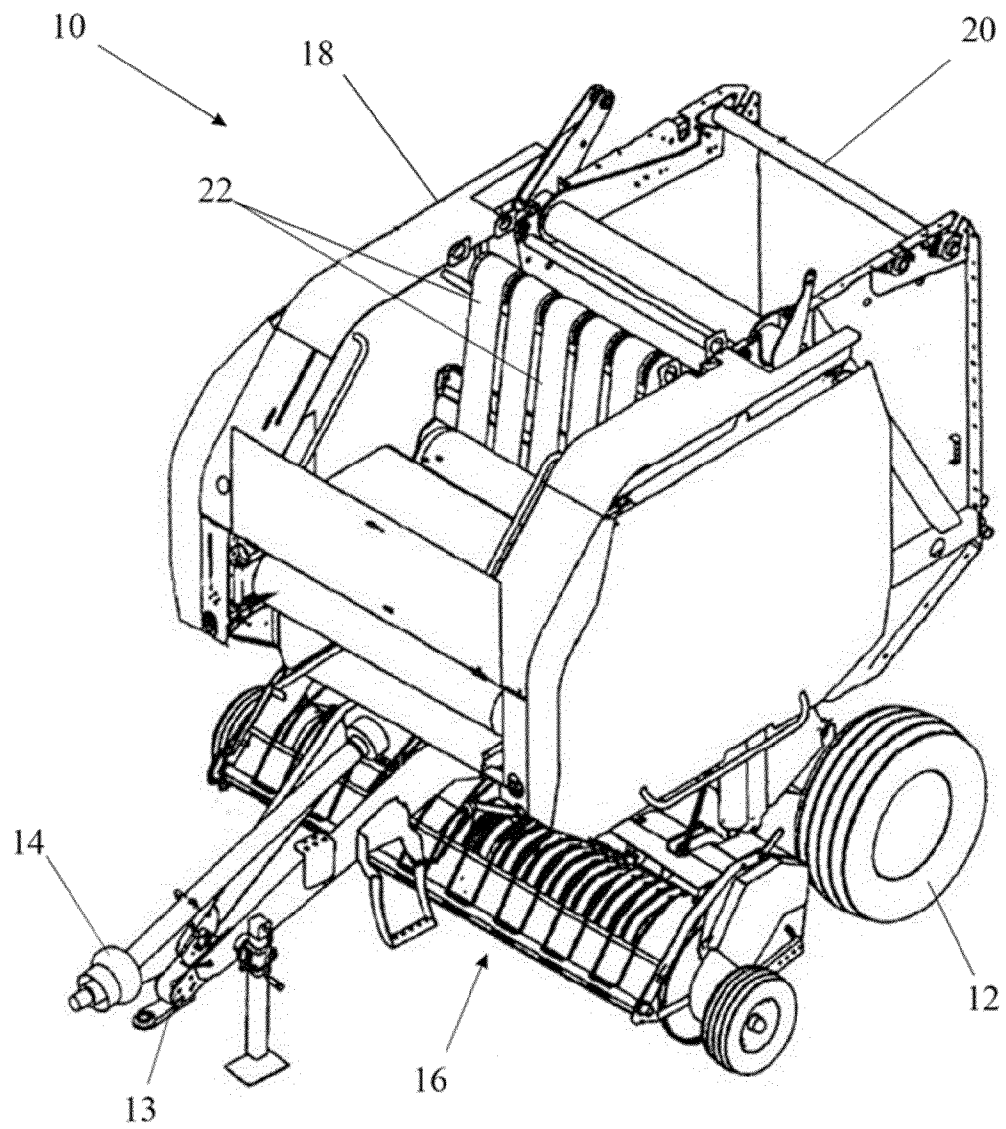


Fig 1

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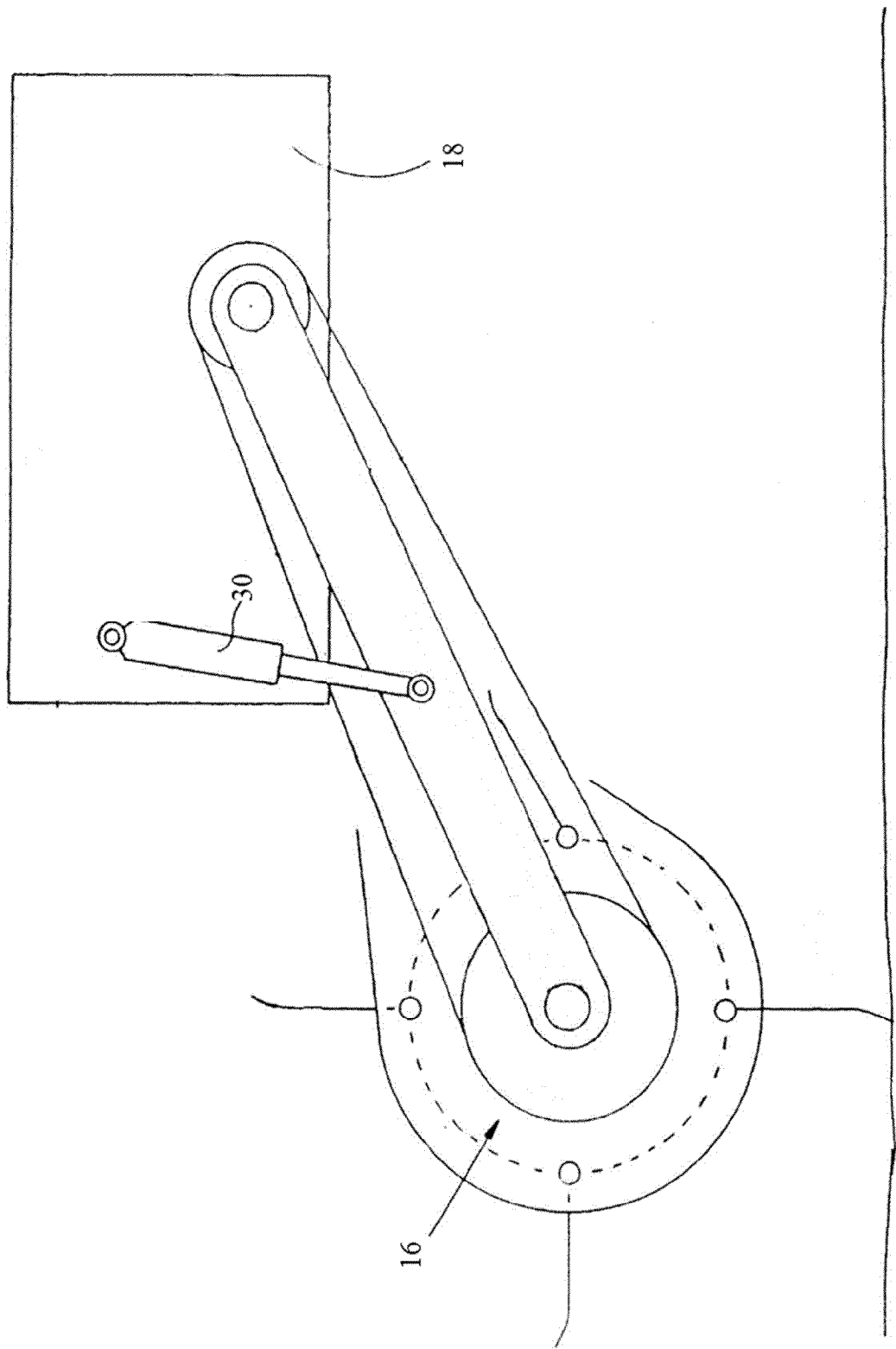


Fig 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2012/057473

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 4, 5
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2012/057473

A. CLASSIFICATION OF SUBJECT MATTER

INV. A01D89/00 A01F15/08
ADD.

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)

A01F A01D

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 practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 813 146 A2 (DEERE & CO [US]) 1 August 2007 (2007-08-01) cited in the application abstract; figure 1 paragraphs [0034], [0036], [0039], [0041], [0046] - [0048] -----	1-3,8
A	EP 2 042 027 A1 (USINES CLAAS FRANCE S A S [FR]) 1 April 2009 (2009-04-01) paragraphs [0005], [0006], [0010], [0015], [0016]; figure 1 -----	1-3,8
A	DE 10 2008 014998 A1 (STRAUTMANN & SOEHNE [DE]) 24 September 2009 (2009-09-24) paragraphs [0001], [0002], [0022] - [0025], [0031], [0033], [0035], [0036]; figure 1 -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

23 July 2012

Date of mailing of the international search report

30/07/2012

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2012/057473

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1813146	A2	01-08-2007	AT 433279 T 15-06-2009
		EP 1813146 A2	01-08-2007
		EP 2036426 A1	18-03-2009
		US 2007175198 A1	02-08-2007
		US 2008224445 A1	18-09-2008

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		EP 2042027 A1	01-04-2009

DE 102008014998 A1		24-09-2009	NONE

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 4, 5

Claims 4 and 5 are not clear considering the included features of claim 1. It is in particular unclear, also after careful consideration of the description, how the speed variation of the pickup after full bale signal can have any effect on uniform bale density when being applied on a lifting pickup. As there is no basis for interpretation claims 4 and 5 remain unsearched.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2) declaration be overcome.