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KR101107772B

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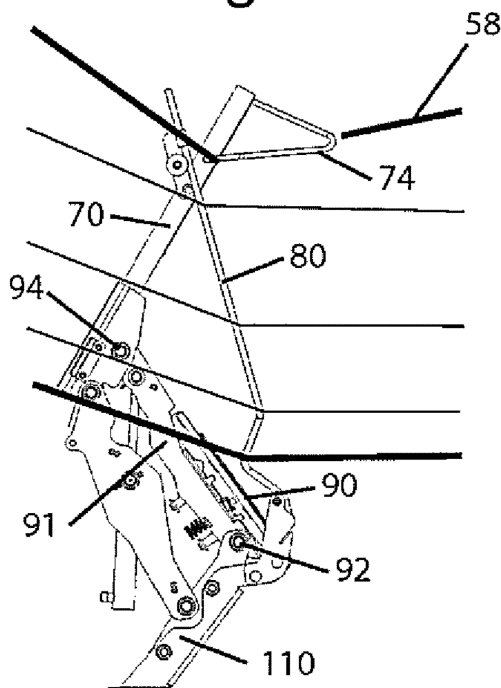
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(54) Title of the Invention: **Film Cutter**
 Abstract Title: **Film cutter for agricultural bale wrapper**

(57) A film cutter for an agricultural bale wrapper includes a support element **80**, a collector element **70**, a cushion element **90** and a knife element **120**. The film cutter is reconfigurable between a collecting configuration in which wrapping film dispensed by the bale wrapper is collected by the film cutter and a clamping configuration in which the wrapping film is clamped between the collector element and the cushion element and is severed by the knife element. The support element is configured to engage the wrapping film when the film cutter is in the collecting configuration and to disengage the wrapping film when the film cutter is in the clamping configuration, and to move from the engaged condition to the disengaged condition without significant sliding contact between the support element and the film.

Fig 4b



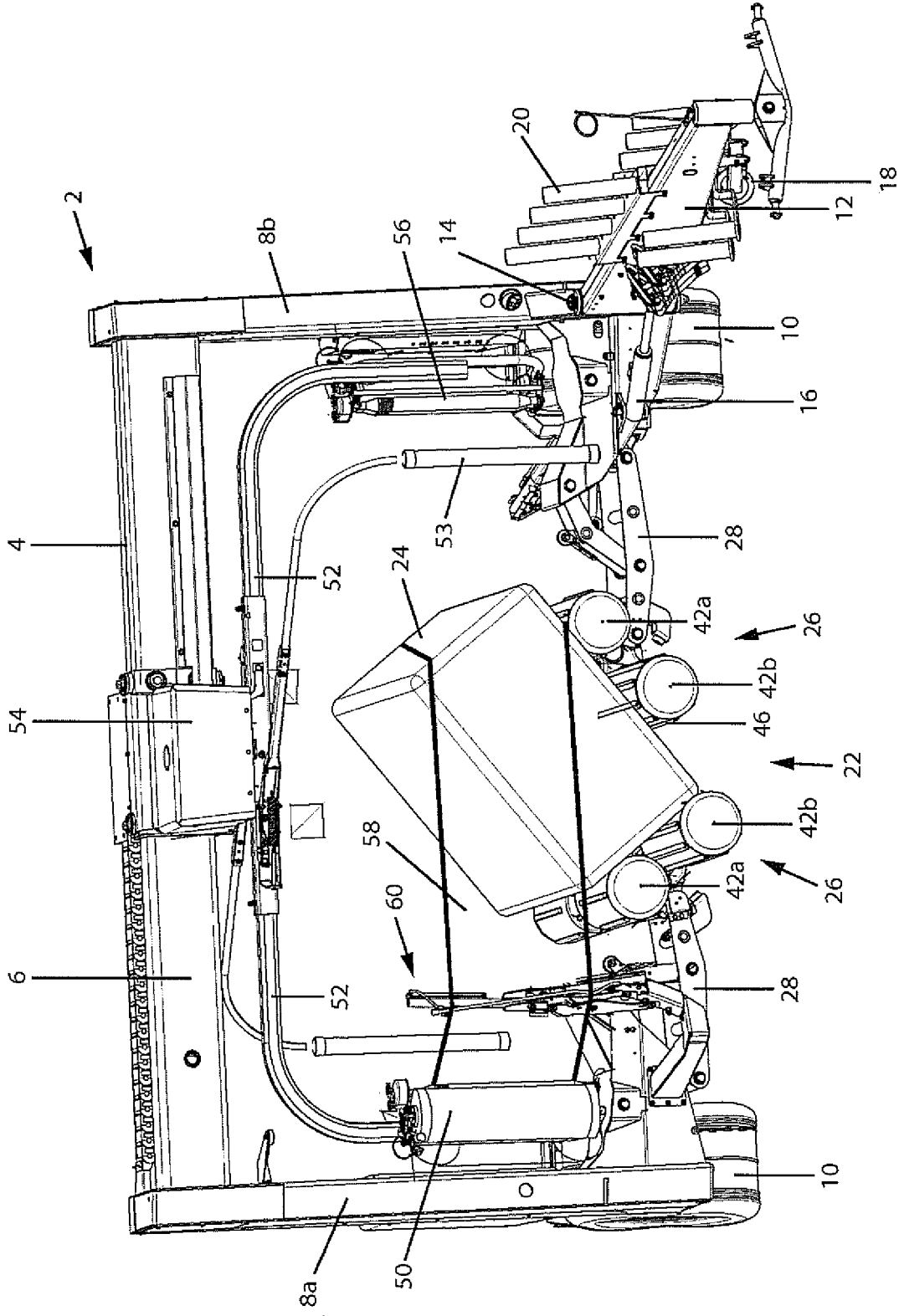


Fig 1

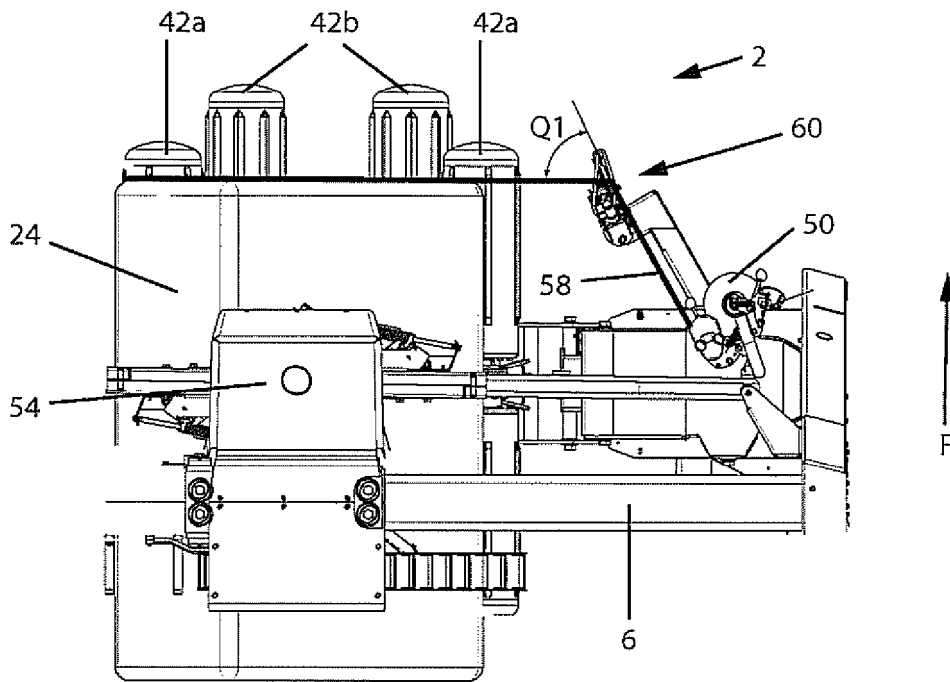


Fig 2a

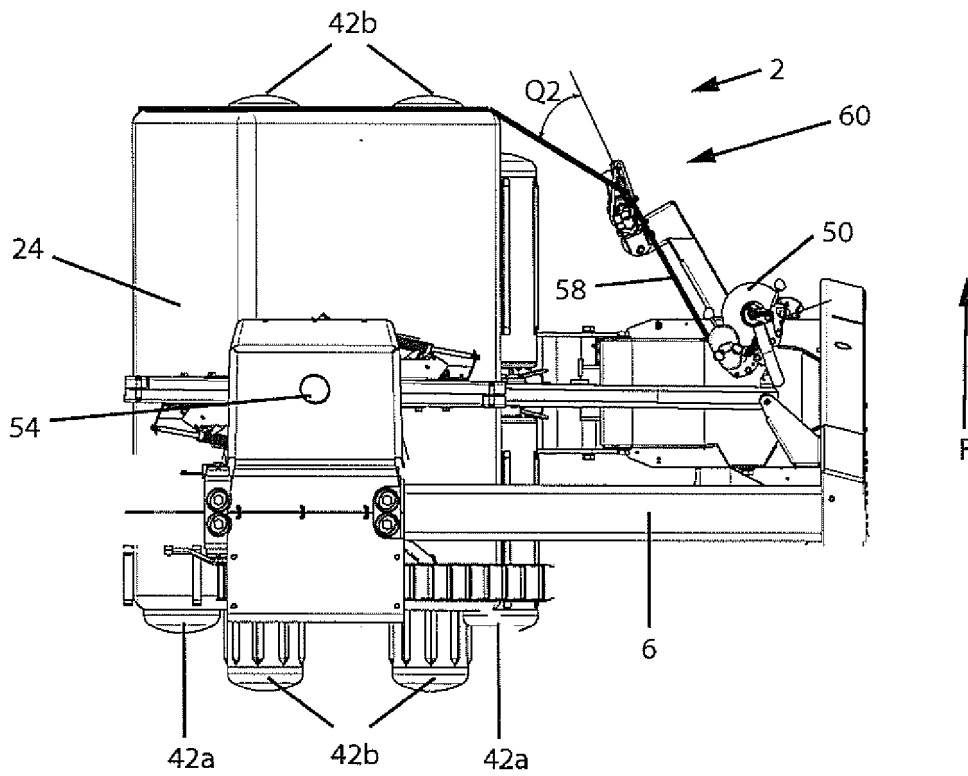


Fig 2b

3/5
PRIOR ART

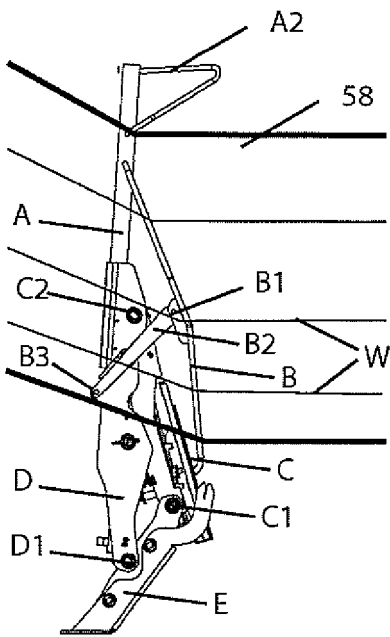


Fig 3a

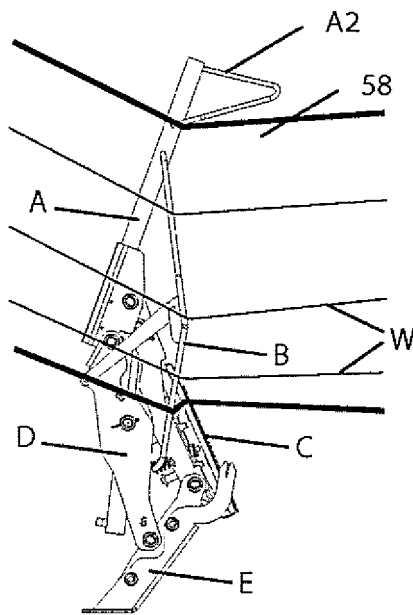


Fig 3b

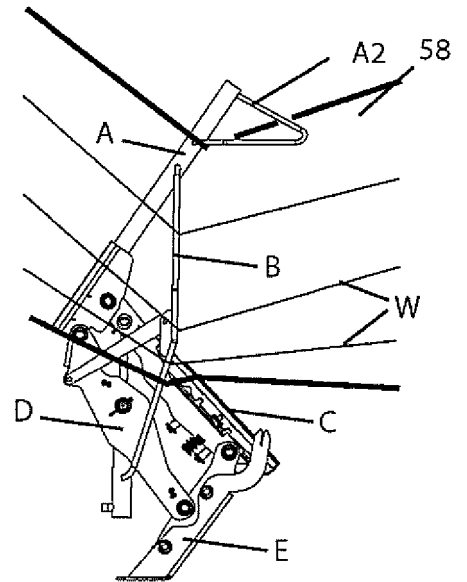


Fig 3c

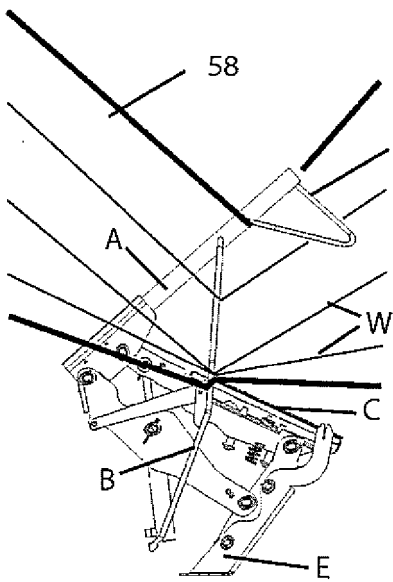


Fig 3d

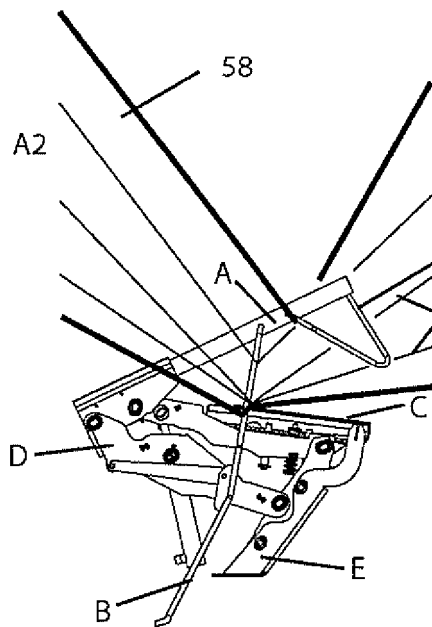


Fig 3e

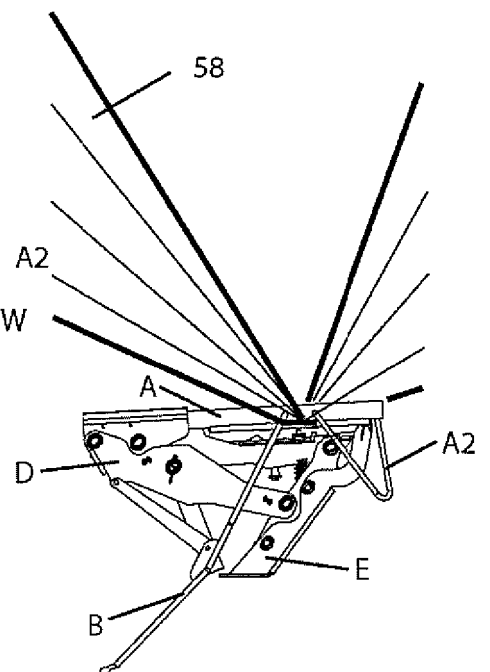


Fig 3f

PRIOR ART

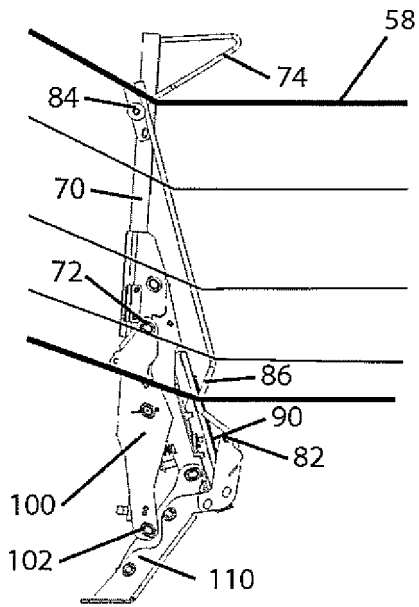
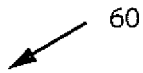


Fig 4a

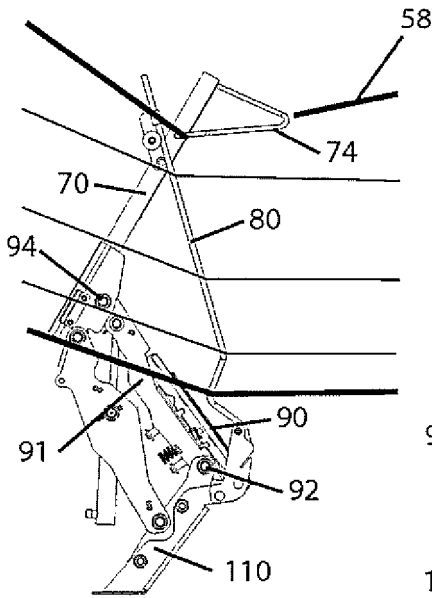


Fig 4b

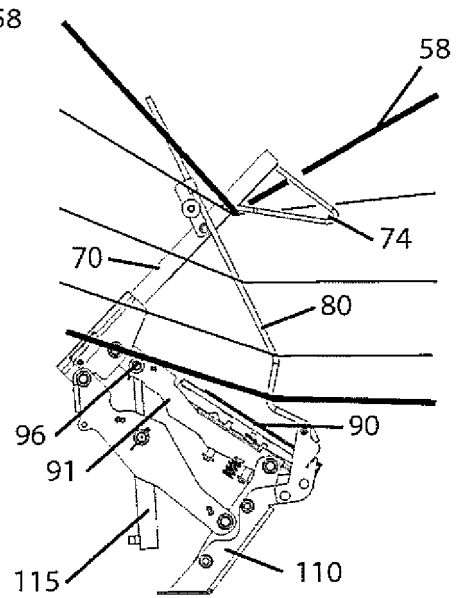


Fig 4c

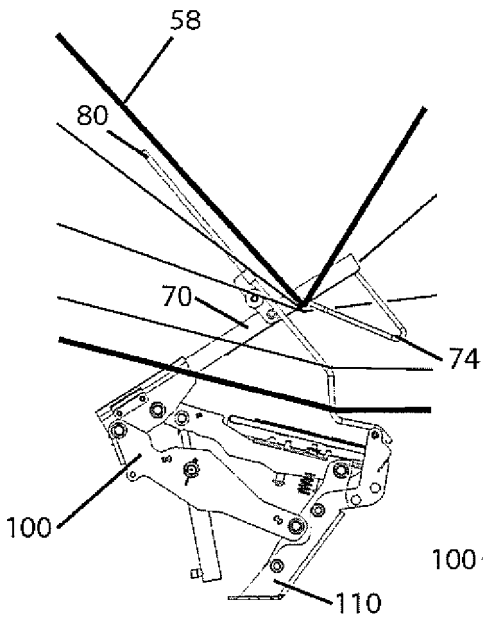


Fig 4d

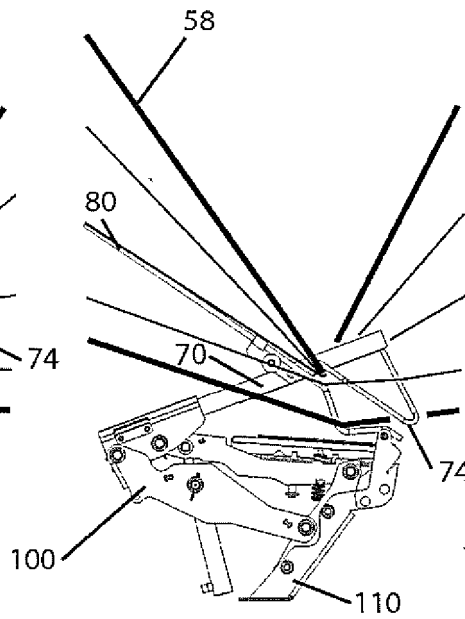


Fig 4e

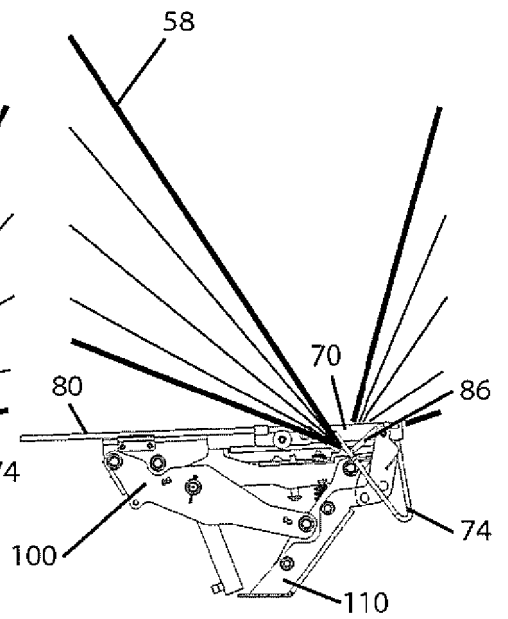


Fig 4f

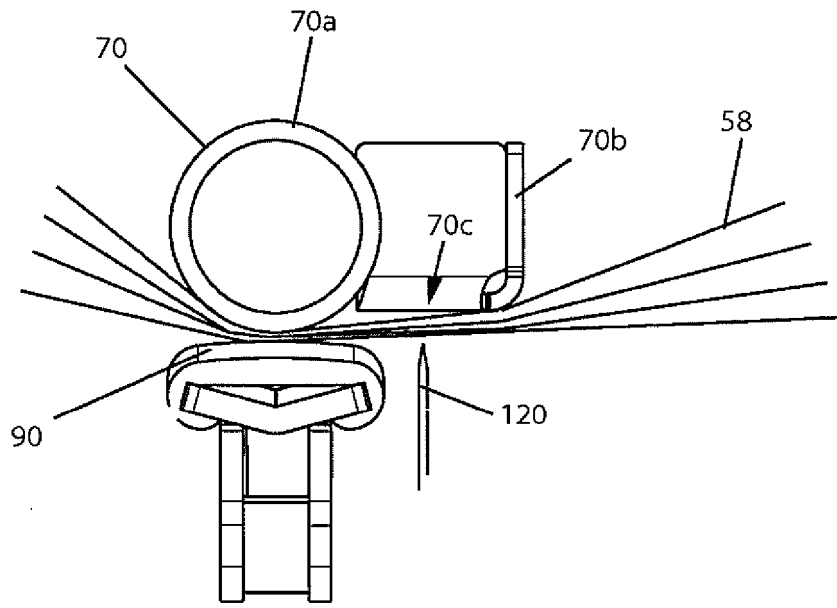


Fig 5a

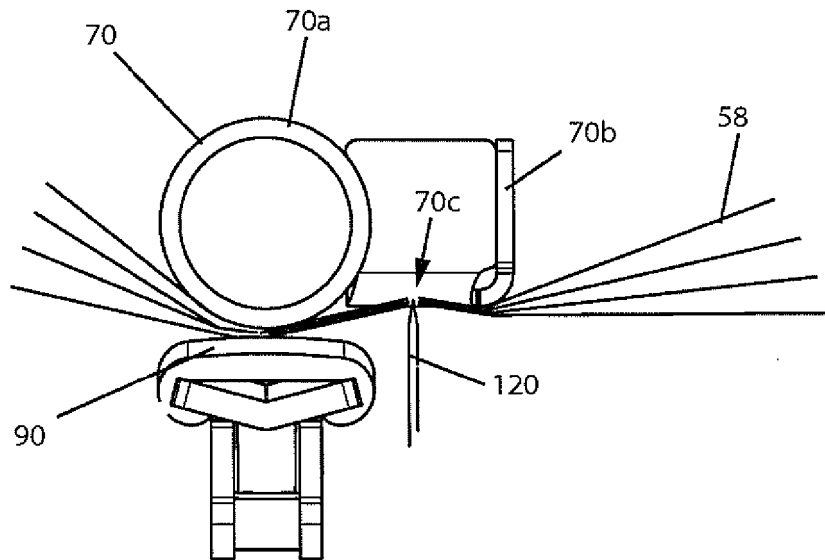


Fig 5b

FILM CUTTER

The present invention relates to a film cutter for an agricultural bale wrapper that applies a stretch film wrapping to the outer surface of an agricultural bale.

The bale wrapper may be either an independently operated machine (which carries out bale
5 wrapping only), or it may be incorporated within a combined baler and wrapper machine.

It is well known to apply stretch film wrapping to agricultural bales, in order to protect the contents of the bale from the weather and, in the case of silage crops, to form a substantially air and watertight enclosure within which the crop can mature or ferment to form silage.

The bale can be either cylindrical (called a "circular" bale) or it can be a parallelepiped (called
10 a "rectangular" or "square" bale). In either case, the bale is generally wrapped by rotating the bale around a horizontal axis while at the same time providing relative rotation about a vertical axis between the bale and a dispenser of the wrapping film. This produces a series of overlapping film layers, which cover the entire outer surface of the bale to form an air and watertight enclosure. Generally, multiple layers of film are applied to increase the puncture-
15 resistance of the wrapper and improve its airtight properties.

There are two main types of bale wrapper in common usage, which are illustrated in Figures 5 and 6 of US 5,327,706. Figure 5 of US 5,327,706 illustrates a satellite-type bale wrapper in which the bale is rotated about a horizontal axis while the film dispenser rotates around the bale about a vertical axis. Figure 6 of US 5,327,706 illustrates a turntable-type bale wrapper
20 apparatus in which the bale is located on a turntable that rotates about a vertical axis while at

the same time rotating the bale about a horizontal axis, thereby applying film to the outer surface of the bale from a stationary film dispenser.

The present invention is concerned mainly with bale wrappers of the satellite-type, although it is also applicable to turntable-type bale wrappers.

- 5 In a satellite-type bale wrapper the bale is placed on a support structure that generally includes at least two parallel horizontally-placed rollers, of which one or more are driven for rotation about a horizontal axis. The bale wrapper also includes at least one film dispenser that is configured to rotate about a vertical axis around the support structure.

In operation, a bale is placed on the support structure and the rollers are driven causing the
10 bale to rotate about a substantially horizontal axis. The film dispenser is simultaneously driven for rotation about its vertical rotation axis. As the support structure and the film dispenser rotate about their mutually orthogonal axes, wrapping film is drawn from the film
15 dispenser onto the bale producing a series of overlapping layers that cover the surface of the bale. At the end of the wrapping cycle, the length of wrapping film between the film
dispenser and the bale is grabbed and severed by a film cutter device and the wrapped bale is then deposited on the ground, allowing a new bale to be wrapped.

We have found that in certain circumstances operation of the film cutter may be unreliable. In particular, we have found that the film may not be completely severed with the result that when the wrapped bale is deposited on the ground and the bale wrapper moves away part of
20 the film wrapping may be pulled away from the bale leaving it partially unwrapped. Alternatively, the wrapping film may be damaged by operation of the film cutter with the result that when another bale is to be wrapped the wrapping film tears and the film dispenser has to be rethreaded manually before wrapping can commence, causing inefficiency and reduced output.

25 These problems occur particularly, but not exclusively, when wrapping square bales. It is believed that this is due to the uneven shape of the square bale and differences in the lengths of the bales. As a result, the angle and position of the film relative to the film cutter cannot be accurately predicted. This makes it difficult to grab and cut the film in a predictable and reliable manner. Therefore, operation of the film cutter may be unreliable.

It is an object of the present invention to provide a film cutter for a bale wrapper apparatus that mitigates at least some of the aforesaid disadvantages.

According to one aspect of the present invention there is provided a film cutter for an agricultural bale wrapper, the film cutter including a support element, a collector element, a cushion element and a knife element, wherein the film cutter is reconfigurable between a
5 collecting configuration in which wrapping film dispensed by the bale wrapper is collected by the film cutter and a clamping configuration in which the wrapping film is clamped between the collector element and the cushion element and is severed by the knife element, wherein the support element is configured to engage the wrapping film when the film cutter is in the
10 collecting configuration and to disengage the wrapping film when the film cutter is in the clamping configuration, and wherein the support element is configured to move from the engaged condition to the disengaged condition without significant sliding contact between the support element and the film.

The term “sliding contact” as used herein means relative movement between the touching
15 surfaces of the support element and the film. Sliding contact between these surfaces causes wear on the surface of the film, which can weaken the film and cause it to tear when subjected to tension. By avoiding sliding contact between the support element and the film it is possible to prevent the damage to the film that can cause it to tear. Thus, more reliable operation of the bale wrapper can be achieved. The film cutter of the present invention is
20 also substantially unaffected by the angle of the wrapping film as it is deflected around the film cutter. Operation of the film cutter is not therefore affected by the position of bale on the bale wrapper, or by the size or shape of the bale.

The support element may for example be configured to extend substantially vertically upwards when the film cutter is in the collecting condition. After the wrapping operation has
25 been completed the film dispenser rotates to stretch a length of film around the film cutter so that the film is deflected around the support element. The support element supports the film in this position until it is collected by the collector element and gathered into a bundle, which is then clamped between the collector element and the cushion element. The support element simultaneously retracts to the disengaged position without significant sliding contact between

the support element and the film. The knife element then severs the film and the wrapped bale is deposited on the ground ready for collection.

Advantageously, the support element extends substantially perpendicular to the length direction of the wrapping film when it is in an engaged condition.

- 5 Advantageously, the support element has a longitudinal axis and is configured to move from the engaged condition to the disengaged condition without significant movement in the direction of the longitudinal axis. The support element may for example be in the form of an elongate rod or bar having a longitudinal axis that extends from one end of the rod or bar to the other end. By avoiding significant movement in the direction of the longitudinal axis,
10 sliding contact between the support element and the film can be avoided or at least reduced to a minimum so as to avoid damaging the film.

Advantageously, the support element is mounted adjacent the collector element and is configured so that when the film cutter is in the collecting configuration the wrapping film is deflected around the support element.

- 15 Advantageously, the support element is configured to pivot about a pivot axis located adjacent a first end thereof. This allows the support element to move away from the film without moving in the axial direction of the support element, and without causing sliding contact between the support element and the film.

- Advantageously, the support element is configured to pivot between an engaged position in
20 which it extends substantially perpendicular to the length direction of the wrapping film and a disengaged position in which it extends substantially parallel to the length direction of the wrapping film. Preferably, the pivot axis is located at or adjacent the lower end of the support element (when the film cutter is in the collecting configuration and the support element is engaged with the film), so that the support element rotates downwards towards a
25 disengaged position below the level of the film.

Advantageously, the support element is configured to pivot through an angle in the range 60° - 120° , preferably 80° - 90° .

Advantageously, the support element is connected to the collector element by a connecting element that allows axial and pivoting movement of the support element relative to the collector element. For example, the support element may be connected to the collector element by a connecting element comprising a pivoting guide device that is attached to the collector element and allows sliding movement of the support element through the guide in the axial direction of the support element. This connecting element and the pivot at the first end of the support element cooperate to control the position of the support element as the film cutter moves between the collecting and clamping configurations.

Advantageously, the support element includes a gathering formation for gathering the film into a bundle. This gathering formation may for example consist of a V-shaped bend in the support element.

Advantageously, the collector element includes a gathering element that cooperates with the gathering formation to gather the film into a bundle. This gathering element may for example consist of a triangular loop of wire or an equivalent structure attached to the distal end of the collector element. The gathering formation and the gathering element together help to form the film into a tight bundle that can be severed cleanly by the knife element.

Advantageously, the collector element is configured to pivot about a pivot axis located adjacent a first end thereof. The first end is preferably the lower end of the collector element. The collector element is also preferably mounted via the pivot axis to a pivot arm that pivots backwards as the collector element pivots forwards to cause a folding movement of the collector element and pivot arm mechanism.

Advantageously, the collector element is configured to lift the film away from the support element as the film cutter is reconfigured from the collecting configuration to the clamping configuration. This helps to prevent sliding contact between the support element and the film and avoids causing damage to the film.

According to another aspect of the invention there is provided a bale wrapper including a bale support assembly that includes means for rotating a bale about a substantially horizontal first axis, at least one film dispenser for dispensing film onto the bale, drive means for causing

relative rotation between the bale support assembly and the film dispenser about a second axis that is substantially perpendicular to the first axis, and a film cutter according to any one of the preceding statements of invention.

Advantageously, the bale support assembly includes at least two roller assemblies for
5 supporting and rotating a bale.

Advantageously, at least one said roller assembly includes a support mechanism that may be actuated to adjust the separation of the roller assemblies.

In a preferred embodiment, the bale wrapper comprises a satellite-type bale wrapper having a rotating film dispenser. Alternatively, the bale wrapper may comprise a turntable-type bale
10 wrapper having a rotating bale support assembly and a fixed film dispenser.

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

Figure 1 is a perspective view showing a bale wrapper apparatus from the front;

Figures 2a and 2b are plan views showing a bale in two different positions on the bale
15 wrapper during a film cutting operation;

Figures 3a to 3f are side views of a prior art film cutter at different stages of a film cutting operation;

Figures 4a to 4f are side views of a film cutter according to an embodiment of the invention at different stages of a film cutting operation; and

20 Figures 5a and 5b are cross-sectional views through the film cutter at different stages of the film cutting operation.

The bale wrapper apparatus, which is indicated generally by the reference number 2, includes an arch-shaped wheel frame 4 in the form of a portal having a cross-beam 6 and two side stanchions 8a,8b, each of which is supported by a wheel 10. The cross-beam 6 is in two parts
25 that are connected telescopically, allowing the width of the portal to be reduced for road transit. A tow bar 12 is connected to the left-side stanchion 8b by a pivot 14. The angle of the

tow bar 12 relative to the frame 4 can be adjusted by means of a hydraulic cylinder 16, so that the bale wrapper apparatus can be towed either directly behind a tractor or displaced to one side thereof. The tow bar 12 also includes a retractable jockey wheel 18 and carriers 20 for spare reels of wrapping film.

- 5 The bale wrapper apparatus 2 includes a bale support assembly indicated generally by the reference number 22 for supporting and rotating an agricultural bale 24. In this example a rectangular bale is shown. It will be understood however that the bale wrapper apparatus may also be used to wrap bales of different shapes. The bale support assembly 22 includes a pair of roller assemblies 26, each of which is connected to one of the side stanchions 8a,8b by a
10 respective swing arm assembly 28. The swing arm assembly 28 allows the respective roller assembly 26 to be moved inwards and outwards substantially parallel to the ground (that is, substantially horizontally).

Each roller assembly 26 includes a pair of rotatable rollers comprising an upper roller 42a and a lower roller 42b. Hydraulic drive motors (not shown) are provided for driving each pair of
15 rollers independently in a clockwise or anti-clockwise direction.

Each roller 42a,42b is supported at its mid-point and the outer portions 43 of each roller 42a,42b are cantilevered, the ends of the roller being free. A plurality of elongate splines 46 are provided on the cylindrical surface of the roller to provide good traction with a supported bale.

- 20 The bale wrapper 2 includes a pair of dispensers 50 for dispensing wrapping film. Each dispenser 50 is mounted on the end of an arm 52 that is rotatably attached to a dispenser drive mechanism 54 mounted on the cross-beam 6. A safety cut-out device 53 that halts operation of the bale wrapper if it contacts an obstruction is associated with each dispenser 50. Each dispenser 50 includes a pre-stretching mechanism 56 for stretching the film 58 before it is
25 applied to the bale 24. These dispensers, safety cut-out devices and pre-stretching mechanisms are all conventional and so will not be described in detail.

The bale wrapper also includes a pair of film cutters 60 for cutting the film 58 after it has been applied to the bale 24, so that the wrapped bale 24 can be deposited on the ground and

wrapping of a new bale can commence. The structure and operation of the film cutters 60 is described in more detail below.

In order to wrap a bale 24, the bale wrapper apparatus 2 is first drawn up to the bale so that the frame 4 straddles the bale. The swing arm assemblies 28, which are initially retracted
5 outwards, are then moved inwards so that the roller assemblies 26 engage the sides of the bale 24. The rollers 42a,42b are rotated by the hydraulic motors so that the inner portion of each roller rotates upwards, thereby lifting the bale 24. At the same time, the swing arm assemblies 28 are moved further inwards, so that the roller assemblies 26 then support the bale 24 from below, as shown in Figure 1.

10 Once the bale has been lifted to this supported position, the ends of the film 58 are fed from the film cutters 60 and the dispensers 50 and attached to the bale 24. The rollers 42a,42b are all then rotated in the same direction (clockwise or anti-clockwise), causing the bale 24 to rotate about a substantially horizontal axis. At the same time, the dispensers 50 rotate about the vertical axis of the dispenser drive mechanism 54, thereby applying a series of
15 overlapping layers of film to the surface of the bale. This continues until the entire surface of the bale has been wrapped with one or more layers of film.

Once wrapping has been completed, the film 58 is severed by the film cutters 60 and the swing arm assemblies 28 are withdrawn outwards to deposit the wrapped bale on the ground. The process is then repeated with another bale.

20 Figures 2a and 2b show a square bale 24 on the bale wrapper 2 during a wrapping process. As the bale 24 is rotated on the rollers 42a, 42b during a wrapping process it is quite common for the bale to become displaced forwards or backwards from a central location on the rollers, particularly for example if the bale wrapper is inclined forwards or backwards during the wrapping operation. This is illustrated in figures 2a and 2b, which show the bale and the bale
25 wrapper in plan view with the forward direction shown by the arrow F.

In figure 2a the bale 24 is displaced towards the rear of the bale wrapper. The rear ends of the support rollers 42a,42b are completely hidden beneath the bale 24 while the front ends of the support rollers 42a,42b protrude significantly beyond the front edge of the bale 24. The bale

has already been wrapped but the length of film 58 that extends from the film dispenser reel 50 to the bale 24 via the film cutter 60 has not yet been cut. Owing to the rearward position of the bale 24 the film 58 is deflected through a relatively large angle $Q1$ where it passes around the film cutter 60. In this example the angle $Q1$ is about 60° . This results in a relatively large force between the film 58 and the film cutter 60, which can cause the film the tear.

In figure 2b the bale 24 is displaced towards the front of the bale wrapper. The front ends of the inner support rollers 42b are just visible beneath the bale 24 while the rear ends of the support rollers 42a,42b protrude significantly beyond the rear edge of the bale 24. The bale has already been wrapped but the length of film 58 that extends from the film dispenser reel 50 to the bale 24 via the film cutter 60 has not yet been cut. Owing to the forward position of the bale 24 the film 58 is deflected through a relatively small angle $Q2$ where it passes around the film cutter 60. In this example the angle $Q2$ is about 30° , although in practice it may be as small as 0° . As a result the force between the film 58 and the film cutter 60 is relatively small, which reduces the risk of tearing. However, the position of the film 58 relative to the film cutter 60 is not well defined, which can prevent the cutter 60 from severing the film 58 cleanly.

It can be seen therefore that the angle of the film 58 as it passes around the film cutter 60 depends on the position of the front edge of the bale relative to the film cutter 60. This angle is influenced by both the position of the bale 24 on the support rollers 42a,42b and the size of the bale. The relatively large potential variation in this angle can lead to unreliable operation of the film cutter, as described above. The same problem occurs when wrapping bales of different lengths.

A prior art film cutter mechanism is shown in Figs. 3a to 3f in various consecutive stages of a film cutting operation. The film cutter includes a collector arm A, a support rod B, a cushion C, a pivot arm D and a fixed support leg E. The mechanism also includes a serrated knife (not shown) for cutting the film. The collector arm A is attached through pivot A1 at its proximal end to pivot arm D and includes a gathering element A2 at its distal end. The pivot arm D is attached through pivot D1 to the fixed support leg E. The collector arm A is configured to pivot forwards (clockwise in Figs 3a to 3f) about pivot A1 during a cutting

operation as the pivot arm D pivots backwards (anticlockwise) about pivot D1 at its proximal end.

The support rod B is attached through pivot B1 to pivot sub-arm B2, which is attached through pivot B3 to pivot arm D. It is configured to move downwards substantially in the axial direction of the support rod during a cutting operation as the film cutter moves from the collecting configuration to the clamping configuration.

The cushion C is attached at one end to the support leg E through a first pivot C1 and at the other end to the collector arm A through a second pivot C2. It is configured to pivot backwards (anticlockwise) during a cutting operation.

Prior to commencement of a cutting operation, the film cutter rests in the fully folded configuration shown in figure 3f. At the commencement of a cutting operation the pivot arm D pivots forwards (clockwise) and the collector arm pivots backwards (anticlockwise) to the positions shown in figure 3a and at the same time the support rod B is lifted to the raised position. As the film dispenser 50 rotates the film 58 is wrapped around the film cutter so that it is deflected around the support rod B and the collector arm A.

During subsequent steps of the cutting operation as shown in figures 3b to 3f the support rod B moves downwards pulling the film 58 down onto the cushion C and the collector arm A rotates forwards (clockwise) to clamp the film 58 against the cushion C so that it can be cut by the knife. It can be seen particularly in figures 3b to 3e that as the support rod B moves essentially in an axial direction (that is, in the direction of the axis of the rod), and in a direction that is substantially perpendicular to the length axis of the film strip 58. As it travels downwards the support rod B rubs against the film 58 that is trapped against the cushion C, producing wrinkles W in the lower part of the film strip. We have found that this relative movement between support rod B and the film strip can damage the film 58, increasing the risk of the film tearing.

It can also be seen in figure 3f that the collector arm A and the gathering element A2 help to gather the film 58 into a bundle as it is clamped against the cushion C. This helps the knife to form a clean cut. However, in practice we have found that the film may not be tightly

bundled, depending on the position of the bale relative to the film cutter when the cutting operation commences.

Once the film has been bundled and clamped between the collector arm A and the cushion C and arm and the cushion are driven downwards relative to the knife to sever the film 58.

5 A film cutter mechanism 60 according to an embodiment of the invention is shown in Figs. 4a to 4f and Figs 5a and 5b in various consecutive stages of a film cutting operation. The film cutter includes a collector arm 70, a support rod 80, a cushion 90, a pivot arm 100, a fixed support leg 110 and a hydraulic actuator 115 that drives the cutter mechanism. The mechanism also includes a serrated knife 120 for cutting the film, as shown in figures 5a and
10 5b.

Referring to figures 4a to 4f, the collector arm 70 is attached through pivot 72 at its proximal end to pivot arm 100 and includes a gathering element 74 at its distal end. The pivot arm 100 is attached through pivot 102 to the fixed support leg 110. The collector arm 70 is configured to pivot forwards (clockwise in Figs 4a to 4f) about pivot 72 during a cutting operation as the
15 pivot arm 100 pivots backwards (anticlockwise) about pivot 102 at its proximal end.

The support rod 80 is attached through pivot 82 at its proximal end to support leg 110, and is attached through a connection device 84 comprising a pivot/slide mechanism towards its distal end to the collector arm 70. It is configured to rotate rearwards (anticlockwise) during a cutting operation about pivot 82. The support rod 80 is largely straight but includes a V-
20 shaped gathering formation 86 adjacent its proximal end.

The cushion 90 is mounted on a pivot link 91, which is attached at one end to the support leg 110 through a first pivot 92 and at the other end to the collector arm 70 through a second pivot 94. It is configured to rotate backwards (anticlockwise) during a cutting operation. The film cutter 60 is driven by the hydraulic actuator 115, which acts between a pivot point 96 on
25 the pivot link 91 and a pivot point (not shown) elsewhere on the bale wrapper.

Prior to commencement of a cutting operation, the film cutter 60 rests in the fully folded configuration shown in figure 4f. At the commencement of a cutting operation the pivot arm 100 rotates forwards (clockwise) and the collector arm 70 rotates backwards (anticlockwise),

and at the same time the support rod 80 is lifted to the raised position as shown in figure 4a. As the film dispenser 50 rotates the film 58 is wrapped around the film cutter 60 so that it is deflected jointly around the support rod 80 and the collector arm 70.

During subsequent steps of the cutting operation as shown in figures 4b to 4f the support rod
5 80 rotates backwards (anticlockwise) away from the film 58, and at the same time the collector arm 70 rotates forwards lifting the film 58 away from the support rod 80. At the same time the collector arm 70 gathers the film 59 into a bundle, which it carries down onto the cushion 90. The collector arm 70 then clamps the bundled film 58 against the cushion 90 so that it can be cut by the knife 120.

10 It can be seen particularly in figures 4b to 4e that the support rod 80 does not rub against the surface of the film 58 as it rotates backwards, thereby avoiding the risk of damaging the film. In particular, there is no axial movement of the support rod 80 relative to the film 58 and virtually no movement in any direction between the support rod 80 and the lower part of the film strip 58. Instead, the film 58 is lifted gently from the support rod 80 by the collector arm
15 70 as it rotates forwards. As the film 58 is bundled wrinkles W are produced in the upper part of the film strip but not in the lower part adjacent the cushion 90. The risk of damaging and tearing the film 58 is therefore considerably reduced.

It can also be seen in figure 4f that the collector arm 70 and the gathering element 72 help to gather the film 58 into a tight bundle against the cushion 90. The V-shaped gathering
20 formation 86 adjacent the proximal end of the support rod 80 also helps to gather the film into a tight bundle. This helps the knife 120 to form a clean cut. The film cutter 60 of the present invention thus enables the film to be tightly bundled, regardless of the position of the bale 24 relative to the film cutter 60 when the cutting operation commences.

Finally, the collector arm 70 and the cushion 90 are driven downwards relative to the fixed
25 knife 120 to sever the film 58. This is illustrated in figures 5a and 5b, where figure 5a shows the film 58 clamped between the collector arm 70 and the cushion 90 prior to severing, and figure 5b shows the situation as the collector arm 70 and the cushion 90 are driven downwards so that the knife 120 severs the film 58. Figures 5a and 5b also show more details of the construction of the collector arm 70, which comprises a round tube 70a and a rigid bar

70b that extends parallel to the tube 70a to provide a slot 70c into which the knife 120 extends when cutting the film 58.

The wrapped bale is finally deposited on the ground so that wrapping of a new bale can commence.

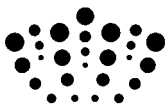
- 5 Various modifications of the invention are of course possible. For example, features of the invention can be applied to either a satellite-type bale wrapper as shown in the drawings, or to a turntable-type bale wrapper in which the bale is located on a turntable that rotates about a vertical axis while at the same time rotating the bale about a horizontal axis. The bale wrapper can also be arranged so that the bale rotates about a first axis and the dispenser
10 rotates about a second axis that is substantially perpendicular to the first axis, where the first axis and the second axis are both substantially horizontal, or where one or both axes are inclined relative to the horizontal. The invention may also be embodied either in a dedicated bale wrapper apparatus or a combined baler and wrapper machine, and it may be employed in a bale wrapper that can be used to wrap either a square bale or a round bale of agricultural
15 material.

CLAIMS

1. A film cutter for an agricultural bale wrapper, the film cutter including a support element, a collector element, a cushion element and a knife element, wherein the film cutter is reconfigurable between a collecting configuration in which wrapping film dispensed by the bale wrapper is collected by the film cutter and a clamping configuration in which the wrapping film is clamped between the collector element and the cushion element and is severed by the knife element, wherein the support element is configured to engage the wrapping film when the film cutter is in the collecting configuration and to disengage the wrapping film when the film cutter is in the clamping configuration, and wherein the support element is configured to move from the engaged condition to the disengaged condition without significant sliding contact between the support element and the film.
2. A film cutter according to claim 1, wherein the support element extends substantially perpendicular to the length direction of the wrapping film when it is in an engaged condition.
3. A film cutter according to claim 1 or claim 2, wherein the support element has a longitudinal axis and is configured to move from the engaged condition to the disengaged condition without significant movement in the direction of the longitudinal axis.
4. A film cutter according to any one of the preceding claims, wherein the support element is mounted adjacent the collector element and is configured so that when the film cutter is in the collecting configuration the wrapping film is deflected around the support element.

5. A film cutter according to any one of the preceding claims, wherein the support element is configured to pivot about a pivot axis located adjacent a first end thereof.
6. A film cutter according to claim 5, wherein the support element is configured to pivot between an engaged position in which it extends substantially perpendicular to the length direction of the wrapping film and a disengaged position in which it extends substantially parallel to the length direction of the wrapping film.
7. A film cutter according to claim 6, wherein the support element is configured to pivot through an angle in the range 60° - 120° , preferably 80° - 90° .
8. A film cutter according to claim 6 or claim 7, wherein the support element is connected to the collector element by a connecting element that allows axial and pivoting movement of the support element relative to the collector element.
9. A film cutter according to any one of the preceding claims, wherein the support element includes a gathering formation for gathering the film into a bundle.
10. A film cutter according to claim 9, wherein the collector element includes a gathering element that cooperates with the gathering formation to gather the film into a bundle.
11. A film cutter according to any one of the preceding claims, wherein the collector element is configured to pivot about a pivot axis located adjacent a first end thereof.
12. A film cutter according to any one of the preceding claims, wherein the collector element is configured to lift the film away from the support element as the film cutter is reconfigured from the collecting configuration to the clamping configuration.
13. A bale wrapper including a bale support assembly that includes means for rotating a bale about a substantially horizontal first axis, at least one film dispenser for dispensing film onto the bale, drive means for causing relative rotation between the bale support assembly and the film dispenser about a second axis that is substantially perpendicular to the first axis, and a film cutter according to any one of the preceding claims.

14. A bale wrapper according to claim 13, wherein the bale support assembly includes at least two roller assemblies for supporting and rotating a bale.
15. A bale wrapper according to claim 13 or claim 14, comprising a satellite-type bale wrapper having a rotating film dispenser.
16. A bale wrapper according to claim 13 or claim 14, comprising a turntable-type bale wrapper having a rotating bale support assembly.



Application No: GB1308044.5
Claims searched: 1-16

Examiner: Bryony Barceló
Date of search: 8 October 2013

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	EP1502495 A1 Krone; see figures 4-6
A	-	KR101107772B Chukham Machinery Co Ltd; see figures 2-4
A	-	US2012/090274 A1 Reijersen; see figures 3-5
A	-	US5189866 A Krutza; see figures 2, 3 and 5
A	-	US5581974 A Underhill et al; see figures 2-4

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

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Worldwide search of patent documents classified in the following areas of the IPC

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The following online and other databases have been used in the preparation of this search report

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International Classification:

Subclass	Subgroup	Valid From
A01F	0015/07	01/01/2006
B65B	0011/04	01/01/2006