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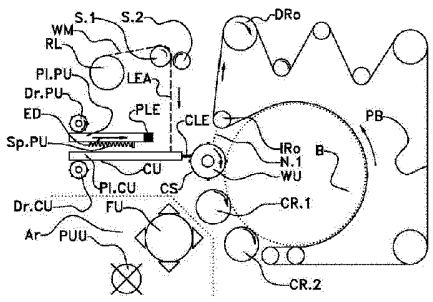
(54) **Apparatus and Method for Feeding Wrapping Material into a Chamber.**

(57) The invention refers to an apparatus for feeding wrapping material (WM) towards an inlet (N.1) of a chamber. A wrapping material supplying unit (S.1, S2) supplies wrapping material (WM). A leading portion of the wrapping material (WM) forms a loose end area (LEA) which sags down, increases and must not drop into an area (Ar). A closing unit (CU) is operated in a closing position in which it closes the area (Ar). The closing unit is pivotable from a parking position into the closing position. The closing unit inhibits the loose end area (LEA) from dropping into the area (Ar). Afterwards a pushing unit (PU) is moved in an engaging direction (ED), hits the loose end area (LEA) laterally and pushes it towards the inlet (N.1.). A wrapping material feeding unit (WU) further conveys the loose end area (LEA) by means of a conveying surface (CS).



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Apparatus and Method for Feeding Wrapping Material into a Chamber

BACKGROUND

The invention refers to a feeding apparatus and a feeding method for feeding wrapping material towards an inlet of a chamber. An object in this chamber has to be wrapped with this wrapping material.

The problem solved by the invention occurs in particular in a round baler for agricultural material which picks up material from the ground, forms a cylindrical bale from this material, wraps the bale with a net made of twine or yarn, or with a plastic sheet and ejects the wrapped bale. The bale in the chamber operates as the object to be wrapped.

PRIOR ART

Fig. 1 of DE 102004023701 A1 shows a baler („Maschine 1“) with a bale forming apparatus („Ballenformeinrichtung 2“) in a bale forming chamber („Ballenkammer 3“). Material is conveyed through an inlet („Einlassöffnung 4“). Wrapping material („Wickelmaterial 28“) is inserted through a further inlet 5 into the chamber 3. A wrapping device („Wickelvorrichtung 26“) for wrapping a bale 29 comprises a reservoir („Vorratsspeicher 27“) and a positioning means („Stellmittel 31“) with a lever arrangement („Hebelanordnung 33“) at the side 32, cf. Fig. 2. A first lever arm („erster Schwenkarm 34“) can be pivoted around an axis 36. A guiding plate („Führungsplatte 37“) and a conveying unit („Förderelement 38“) in the form of a roller together form a guiding track for the wrapping material 28. The guiding plate 37 can be shifted by the lever arm 34. Fig. 2 shows the wrapping device in the feeding position („Zuführstellung“). The wrapping material 28 is guided around the guiding rollers („Umlenkrollen 47, 48“) and a cutting rod („Schneidestange 42“) into the nip 5 arranged between the two rollers 11, cf. Fig. 2. A brake („Bremse 44“) decelerates and stopps the feeding of further wrapping material 28. The roller 38 and afterwards the rotating bale 29 grasp the wrapping material 28. The positioning means 31 pivots the lever arm 34 into the position of Fig. 3. The brake 44 is released. If the wrapping of the bale 29 is completed, the cutting arm 43 is moved into the position of Fig. 4 and the wrapping material 28 is severed. The leading edge of the wrapping material 28 is disposed on the feeding table („Zuführtisch 52“) or directly on the feeding roller

38. The feeding table 52 improves the transfer of the wrapping material 28 into the inlet 5.

In EP 1808065 A1 a bale wrapping device 200 is described. A bale 400 is formed in a bale forming chamber 202 and is wrapped by a device 100, cf. Fig. 1. A net 1 is pulled off from a reel 10 by a first drive role 21 and a second compression role 22, cf. Fig. 2 and Fig. 3. Afterwards the net 1 is inserted into the bale forming chamber 202 through an inlet 5. The inlet 5 is formed by a guiding roller 205 and a tumbling roller 206. The guiding roller 205 guides several round belts 204 which contribute to forming the bale 400, cf. Fig. 3. The feeding means 21, 22 are arranged with a distance to the inlet 5 to allow debris to be dropped. A supporting means 3 can be moved into a receiving position 6 away from the inlet 5 and a position near the inlet 5, cf. Fig. 2. When being moved from the receiving position 6 towards the inlet 5, the supporting means 3 urges the net 1 into the inlet 5. In one implementation a supporting plate 31 of the supporting means 3 urges the net 1 in the inlet 5. Two bars 32 are rotatable mounted and carry the supporting plate 31, cf. Fig. 3. An electrical motor brings the bars 32 into the receiving position 6 against the force of a spring. When the bars 32 are unlocked, the spring moves the bars 32 and the supporting plate 31 rapidly towards the inlet 5.

Fig. 1 of DE 9211541 U1 shows a round baler with a chamber for creating and wrapping a bale („Wickelraum 8“). The bale rotates in the direction of the arrow 12 and is to be wrapped into wrapping material („Füllbahn 13“) which is initially stored on a reel („Vorratsrolle 15“). Two feeding rollers („Abzugswalzen 18, 19“) pull wrapping material 13 from the reel 15. A jogger element („Rüttelteil 24“) rotates a pivoting axis („Schwenkachse 25“) being perpendicular to the drawing plane of Fig. 2 and Fig. 3. A lever 26 connects the jogging element 24 with a spring („Feder 27“). A rope („Seil 28“) extends the spring 27 which in turn makes the jogging element 24 rotating. A connecting lever („Koppelglied 29“) is pressed against a kind of a cam („Kurvenbahn 30“). This cam 30 belongs to a wrapping role („Wickelwalze 9“). The wrapping role 9 with the cam 30 rotates around the axis 32. The rotating cam 30 makes the connecting lever 29 oscillating. The wrapping material 18 sags down from the feeding rollers 18, 19 and is guided by the oscillating jogging element 24 towards the inlet („nip 7“). A guiding sheet („Leitblech 35“) closes the space between the feeding roller 19 and the wrapping roller 9. This element prevents the

wrapping material 13 to be guided against the wrapping roller 9 which event is undesired.

Fig. 1 of WO 2011/033494 A1 shows a baler 1 which forms a bale in a compressing chamber by using a compression belt 18 guided around several support rollers 20. Material is guided into the chamber through an inlet between the two rollers 30, 31. Binding material (netting material 39) is provided by a dispenser 38 and is inserted through an inlet 37 between the bale forming roller 32 and the compression belt 18. A deflecting roller 42 deflects and feeds the netting material 39 into the inlet 37, cf. Fig. 2. Two spaced apart carrying plates 43 carry the deflecting roller 42 and are mounted on a pivot shaft 44 which is pivotally mounted at both side walls 10. A drive transmission 41 drives the roller 42 continuously in the direction of the arrow G, i.e. clockwise. The pivot shaft 44 pivots the deflection roller 42 into a deflecting position, shown in Fig. 2 and Fig. 3, in which the deflection roller 42 guides the netting material 39, and into an idler position shown in Fig. 1. When the deflection roller 42 is in the idler position, material can fall through the inlet 37 back to the ground. A hydraulic ram 50 and a lever 51 urge the deflection roller 42 into the idler position. A gas spring 56 in turn urges the deflection roller 42 in the deflecting position, cf. Fig. 4 and Fig. 5. A guide means with a plurality of flexible guide fingers 71 guides the netting material 39 away from the compression belt 38 and towards the bale forming roller 32 such that the compression belt 38 cannot press the netting material 39 out of the inlet 37, cf. Fig. 8(a) to Fig. 8(b). These figures also show the effect of the deflection roller 42.

Fig. 1 of DE 3617155 A1 discloses a round baler („Rundballenpresse 1“) with a pressing chamber („Pressraum 3“) and a wrapping arrangement („Hülleinrichtung 7“). Crop material („Erntegut 2“) is picked up and is conveyed through a crop material inlet („Guteintrittsöffnung 6“) into a pressing chamber 3 where a bale („Erntegutballen 8“) is formed. The wrapping arrangement 7 wraps a bale 8 in the pressing chamber 3 with a portion of wrapping material („Hüllbahn 13“). This wrapping arrangement 7 has a reel („Vorratsrolle 14“), a feeding mechanism („Zuführmechanismus 15“) and a cutting mechanism („Schneideeinrichtung 16“), cf. Fig. 2.

The piston-cylinder unit („Kolben-Zylinder-Einheit 18“) of DE 3617155 A1 clamps the wrapping unit 13 by means of a clamping unit („Klemmeinrichtung 26“) and pulls off wrapping material 13 from the reel 14. A U-shaped cover („U-förmige

Abschirmung 46“) protects the knife („Trennmesser 44“), cf. Fig. 3. The free end 13a of the wrapping material 13 is placed onto a down holder („Niederhalter 55“). The feeding mechanism 15 moves the free end 13a towards the starter roller („Starterrolle 11“). The free end forms a loop („Schlaufe“) which is shown in Fig. 4 with dotted lines. The free end 13b of the loop is grasped by the circumferential surface („Umfangsfläche 12“) of the starter roller 11. This free end 13 is conveyed through the nip between the starter roller 11 and the pressing roller („Antriebswalze 9“) and later through the inlet 6 into the pressing chamber 3, cf. Fig. 5. The wrapping material 13 is guided around the cover („Abschirmung 47“) and the corresponding guiding bar („Gegenumlenkleiste 48“), cf. Fig. 4. The bale 8 rotates in the pressing chamber 3 and takes the wrapping material 13 („wird mitgenommen“). The knife 44 severs the wrapping material 13.

The Welger patent DE 10243294 B4 describes a baler for producing round bales. The bale is created in a pressing chamber („Pressraum 5“) by means of a conveying and pressing belt („Förder- und Pressriemen 9“) and several pressing rollers 6,7, 8 being in contact with material guided into the pressing chamber 5. Material to be pressed is supplied by a pick-up unit („Aufsammler 15“) and a feeding unit („Förder-/ Schneidrotor 16“) through a feeding aperture („Zuführöffnung 14“) into the chamber 5. The bale is wrapped with wrapping material („Umhüllmaterial 22“) which is stored in a reservoir („Vorratsbehälter 19“) containing a wrapping material role („Umhüllmaterialrolle 20“). Two pulling rollers („Vorzugswalzen 21“) pull the wrapping material 22 from the role 20. A loose end („freies Vorlaufende 26“) of the wrapping material 22 sags. A feeding roller („Zuführwalze 25“) shifts the sagging wrapping material toward the pressing roller 8. The loose end 26 is guided through a nip („Einführspalt 23“) between the pressing roller 8 and a roller 24 around which the belt 9 is guided. The feeding roller 25 can be shifted or pivoted between a parking position 27 which is shown in dotted lines and an operating position 29 shown in continuous lines. By shifting or pivoting the feeding roller 25 into the parking position 27 the nip 23 between the feeding roller 25 and the driven roller 8 is enlarged. Material in the nip 23 drops into the feeding unit. In the embodiment of Fig. 2 the pulling roller 21 and the feeding roller 25 (in Fig. 2: roller 30) are integrated into an assembly („Baueinheit 32“) which can be rotated around the axis 33. Fig. 3 shows an embodiment where this assembly unit is shifted and not rotated.

The invention described in DE 10243294 B4 solves the problem of removing debris from an injection nip. This baler requires a feeding roller which can be rotated as well as shifted laterally and perpendicular to its rotation axis.

PROBLEM, SOLUTION

Therefore it is an object of the invention to provide a feeding apparatus and a feeding method for feeding wrapping material towards an inlet of a chamber in which chamber an object is to be wrapped with wrapping material wherein the wrapping material is conveyed such that it is afterwards inserted successfully into the chamber even if debris may have polluted the inlet and wherein the need of enlarging and narrowing a nip between conveying units is avoided and the risk of a jam or a blockade of the feeding apparatus by the wrapping material is reduced even if a part of the feeding apparatus fails to work properly.

The problem is solved by a feeding apparatus with the features of claim 1 and a feeding method with the features of claim 0. Preferred embodiments are specified in the dependent claims.

The solution according to the invention refers to a feeding apparatus and a feeding method. An object in a chamber has to be wrapped into wrapping material. By the feeding apparatus and by the feeding method the wrapping material is fed towards an inlet of this chamber.

A wrapping material supplying unit can be operated in a supplying mode and pulls the wrapping material from a reservoir. Thereby the wrapping material supplying unit supplies the wrapping material and conveys it towards the inlet. A leading portion of this wrapping material sags down and forms a loose end area. This loose end area extends downward from the wrapping material supplying unit. As the wrapping material supplying unit continuous to supply wrapping material, the loose end area increases until it reaches the chamber.

A pushing unit is mounted such that the increasing loose end area comes into a position between the pushing unit and the inlet. The pushing unit can be moved in an engaging direction towards the inlet. When the pushing unit is moved in the engaging direction towards the inlet, the pushing unit hits the sagging loose end area of the wrapping material and pushes it laterally towards the inlet in the engaging direction. The term “pushing laterally” refers to the vertical direction of the increasing loose end area.

A closing unit is arranged below the pushing unit. This closing unit can be operated in a closing position. The closing unit is permanently or temporarily in the closing position and at least while the pushing unit is moved in the engaging direction towards the inlet of the chamber. In this closing position the closing unit closes entirely or at least partially an area in which the wrapping material must not drop. The closing unit in the closing position is arranged between the wrapping material and this area. This area is arranged besides and/or below the wrapping material supplying unit and angularly below the inlet. The closing unit is arranged above this area. The closing unit in the closing position inhibits the wrapping material from dropping into the area.

ADVANTAGES

The pushing unit pushes the leading portion in the engaging direction towards the inlet even if debris is collected in the inlet. This debris is collected after it was rubbed off from the object and after it was ejected out of the chamber. Therefore the moving and shifting pushing unit allows inserting the wrapping material into the chamber against the resistance of this debris.

The pushing unit allows arranging the wrapping material supplying unit such that the loose end area and therefore the leading portion sag down with a distance to the inlet of the chamber. It is not necessary that the loose end area is situated vertically above the inlet. The pushing unit pushes the sagging loose end area of the wrapping material laterally towards the inlet. It is quite easy to adapt the position and the engaging direction of the pushing unit to the arrangement of the wrapping material supplying unit with respect to the inlet. This makes the implementation of the wrapping material supplying unit more easy as the wrapping material supplying unit can be arranged besides and outsides the chamber and not necessarily above the chamber or even inside the chamber. This arrangement besides the chamber makes it easier to add a new reel with wrapping material to the reservoir if one reel is entirely used. In addition it is easier to arrange the feeding apparatus in the available space of a machine comprising the feeding apparatus.

The pushing unit increases the availability of the feeding apparatus in particular if the orientation of the loose end area with respect to the inlet may change and cannot predicted precisely. This may in particular take place if the feeding arrangement is implemented on a vehicle and the vehicle moves over a hilly ground

or is accelerated and decelerated. In addition the loose end area may be subjected to environmental influences, e.g. to wind or rain.

The pushing unit also increases the availability in particular in that case that the same feeding apparatus is used with different kinds of wrapping material or for wrapping objects with different surface properties.

The pushing unit shifts the wrapping material towards and through the inlet even if debris is collected in the inlet. Therefore the pushing unit saves a specific cleaning unit for the inlet.

The pushing unit saves the need to implement a specific cleaning unit which cleans the inlet of the chamber from debris and from dirt. Such a cleaning unit needs a drive and must be monitored. Thanks to the invention it is sufficient to use the pushing unit for cleaning the inlet. But it is also possible to combine the pushing unit with a specific cleaning unit.

According to the invention a closing unit below the pushing unit inhibits the loose end area of the wrapping material from dropping into the area. The wrapping material must not drop into this area as the wrapping material being in the area may be grasped by a rotating element or may be attached to a protruding element, e.g.

The feeding apparatus comprises the closing unit in particular because the pushing unit may hit the sagging loose end area (leading portion) too late. It may even happen that due to a malfunction the pushing unit is not moved at all in the engaging direction or is not moved far enough and does not hit the loose end area at all. It is also possible that the pushing unit moves too late in the engaging direction and hits the wrapping material too late – the wrapping material is already dropped into the area. Without the closing unit the loose end area would drop into the area besides and/or below the inlet and the pushing unit and may be grasped by a rotating unit, e.g. a feeding rotor, which operates in this area. The closing unit prevents such an undesired event which otherwise would block an arrangement with the feeding apparatus and would often require a manual maintenance. Even if the pushing unit does not hit and push the wrapping material, the closing unit is below the wrapping material and the area and prevents the wrapping material from dropping into the area. The closing unit also saves the need that the pushing unit must precisely and automatically be monitored and the wrapping material supplying unit must be stopped in the case of a detected malfunction of the pushing unit.

The closing unit in the closing position also protects a human from grasping into the area. Therefore the invention better protects a human operator.

One further advantage of the invention is therefore that thanks to the invention the availability of the arrangement is increased. Providing the closing unit allows a larger tolerance in the synchronization between the wrapping material supplying unit and the pushing unit. Thanks to the closing unit no malfunction occurs even if the pushing unit fails to push the loose end area away from the area or pushes it too late away from this area. Therefore the invention with the closing unit increases the availability of an arrangement with the feeding apparatus, e.g. a bale forming and wrapping apparatus.

EMBODIMENTS

In one embodiment the closing unit is stationary mounted – or at least stationary during normal operation. Preferably a closing unit clearing unit is moved with respect to the stationary closing unit and removes debris and other material from the upper surface of the closing unit.

Preferably the closing unit is not stationary but pivotally mounted. The closing unit can be pivoted from the closing position into a parking position and back from the parking position into the closing position. The closing unit in the parking position releases the area besides and/or below the pushing unit and the area into which the wrapping material must not drop.

According to the embodiment with the pivotally mounted closing unit the closing unit is pivoted between the parking position and the closing position. The closing unit is therefore not a stationary element which permanently closes the area into which the wrapping material must not drop. If this area were permanently closed, debris from the object in the chamber and dust etc. would be collected on the closing unit and would disturb the step of injecting the wrapping material into the inlet. To remove this debris from a stationary closing unit a specific cleaning unit or a manual cleaning operation would be required.

Thanks to the preferred embodiment this area is only temporarily closed, namely only as a long as the closing unit is in the closing position. Debris and dust can drop downwards as long as the closing unit is in the parking position. Therefore the closing unit is preferably in the parking position at least as long as the wrapping material supply unit does not supply wrapping material. Preferably the

closing unit is pivoted back into the parking position after the wrapping material is injected through the inlet into the chamber and is grasped in the chamber such that the wrapping material cannot drop into the area.

A refinement of this embodiment is as follows: First the closing unit is pivoted into the closing position. The closing unit is preferably pivoted into the closing position before the loose end area reaches the pushing unit. Afterwards the pushing unit is moved in the engaging direction and pushes the leading portion towards the inlet.

In a further refinement of the embodiment with the pivotal closing unit the feeding apparatus comprises a closing unit drive for pivoting the closing unit. This makes it easier to let the closing unit operate as long as possible in the parking position and as long as necessary in the closing position.

In one embodiment the closing unit is connected with a further moving object and is pivoted together with this object by a common drive. In a further objected a dedicated closing unit drive pivots the closing unit. The drive can comprise a positioning means and a spring. The spring pushes the cleaning unit into the closing position. The positioning means pivots the closing unit back in the parking position.

Preferably the feeding apparatus further comprises a wrapping material feeding unit with a conveying surface. This conveying surface moves in a continuous manner and conveys the loose end area of the wrapping material towards the inlet. Preferably the conveying surface conveys the leading portion after the pushing unit has hit the loose end area. This wrapping material feeding unit further reduces the risk that the apparatus fails to insert the wrapping material into the chamber. Preferably the wrapping material feeding unit is arranged between the inlet and the area into which the wrapping material must not drop. The increasing loose end area is shifted against the conveying surface of the wrapping material feeding unit and is further conveyed towards the inlet.

The conveying surface of the wrapping material feeding unit preferably has several protrusions. The conveying surface and in particular the conveyed protrusions remove debris out of the inlet and away from the chamber. In addition the conveying surface conveys the wrapping material towards the inlet even if the pushing unit does not hit the wrapping material due to malfunction.

Preferably the feeding apparatus is arranged such that this wrapping material feeding unit is situated between the inlet and the area into which the leading portion must not drop.

Preferably the closing unit operates in the closing position at least before the pushing unit is moved in the engaging direction. This embodiment increases the reliability of the apparatus as the closing unit is early enough in the closing position.

In one embodiment the movement of the pushing unit is started after the closing unit has reached its closing position. In an alternative embodiment the movement of the pushing movement is already started before the closing unit has reached its closing position and after the pivoting of the closing unit has started.

In one embodiment the event that the wrapping material supplying unit starts to supply wrapping material triggers the step of pivoting the closing unit into the closing position.

Preferably the wrapping material supplying unit comprises a conveying surface which is continuously driven and which conveys the leading portion of the wrapping material towards the inlet. A continuous movement stresses the material less than an oscillating or otherwise discontinuous movement.

In one embodiment the closing unit in the closing position is situated directly above the area into which the wrapping material must not drop. This embodiment saves vertical space. In an alternative embodiment a distance between the area and the closing unit above the area occurs. This embodiment yields a greater tolerance for the mounting and the pivoting of the closing unit. A section of the wrapping material may temporarily come into a position below the closing unit without dropping into the area.

In one embodiment the closing unit is pivoted by a closing unit drive and operates additionally as a further pushing unit. A leading edge of the closing unit hits the loose end area of the wrapping material laterally and shifts this loose end area towards the inlet. By this shifting step the wrapping material is prevented from dropping into the area. A distance between the leading edge of the closing unit and a wrapping material feeding unit besides the inlet remains. This embodiment omits a contact between the wrapping material feeding unit and the closing unit. An undesired interaction is avoided. This embodiment has the consequence that the leading edge of the wrapping material passes the closing unit before the closing unit

reaches the closing position. In this embodiment the closing unit inhibits the wrapping material from dropping into the area by pushing the loose end area laterally before it reaches the area.

In an alternative embodiment the closing unit is pivotally mounted and reaches the closing position before the leading edge reaches the closing unit. Or the closing unit passes the path of the increasing leading portion and inhibits this leading portion from further moving downwards. The closing unit blocks the further downward path of the leading portion. An increasing portion of the loose end area is placed onto an upper surface of the closing unit until the pushing unit hits the loose end area. The closing unit in the closing position supports in the step of guiding the leading portion towards the inlet. In this embodiment the closing unit in the closing position covers the area and inhibits by this the leading portion from a dropping into the area as this area is covered by the closing unit.

In a refinement of this embodiment the closing unit is arranged such that the closing unit in the closing position touches a wrapping material feeding unit besides the inlet. A conveying surface of this wrapping material feeding unit conveys the wrapping material towards the inlet. The closing unit reaches the closing position before the sagging and increasing leading portion of the wrapping material can reach the closing unit. The closing unit entirely closes the area. A leading edge of the wrapping material cannot drop in a position below the closing unit. This embodiment avoids with an even higher security the undesired event that the wrapping material drops into the area. This embodiment increases the availability in particular if the feeding apparatus is a part of a vehicle which is moved over a hilly ground such that the position of the leading portion with respect to the area can vary. Preferably the leading edge of the closing unit is made of an elastic material, e.g. of rubber.

Preferably the pushing unit comprises a plate with a free edge. This free edge operates as the leading edge when the pushing unit is moved in the engaging direction. Preferably also the closing unit comprises such a leading edge. These leading edges are in one embodiment made from a material with a low friction coefficient such that only a low friction between the leading edges and the wrapping material and the wrapping material conveying unit occurs. The embodiment with the plate requires less material than a lever such that the pushing unit and the closing unit can be moved with less energy.

In one embodiment the pushing unit is moved into the inlet when being moved in the engaging direction. In a refinement the pushing unit be moved to the engaging position engages the inlet. In a further refinement the pushing unit into the engaging position even touches the object in the chamber. This embodiment further reduces the risk that debris in the inlet inhibits the wrapping material for being inserted into the chamber through the inlet.

Preferably the pushing unit is moved in the engaging direction with a purely linear movement, i.e. a purely translational movement. This embodiment enables a directed and guided impact onto the wrapping material and a more direct impact than a rotating movement effected by a lever arrangement, e. g.

In an alternative embodiment the pushing unit comprises a plate which is rigidly connected with at least one lever, preferably with two levers for preventing canting. The lever or all levers synchronously can be rotated around the pivoting axis in both directions. Rotating the lever(s) in the one rotating direction causes the plate of the pushing unit to be moved in the engaging direction. Rotating the levers in the opposite direction causes the plate to be moved from the engaging position into a parking position.

In one embodiment the closing unit is also pivoted with a purely linear movement. This purely linear movement does not require much space in vertical direction. The closing unit can be arranged directly above a rotating unit and directly above the area to be covered.

In an alternative embodiment the closing unit can be pivoted around a pivoting axis. This pivoting axis is preferably horizontal and perpendicular to the engaging direction in which the pushing unit shifts the wrapping material. Pivoting the closing unit into the closing position comprehends the step that the closing unit is rotated around this rotating axis. This step required less kinetic energy and less power.

In a refinement of this embodiment the closing unit is rotated upwards into the engaging position and is rotated downwards out of the closing position into a parking position. The closing unit in the parking position is sloping downwards such that debris on the upper surface of the closing unit in the parking position slips downwards.

In one embodiment the object is created in the chamber and afterwards wrapped in this chamber. The step that the creation of the object is finished triggers

the step that the closing unit is pivoted into the closing position. The closing unit is pivoted back into a parking position as soon as possible, e.g. if the leading portion of the wrapping material was injected through the inlet into the chamber.

The feeding apparatus according to the invention can be used in a stationary arrangement, e.g. in an arrangement for wrapping a bale made of paper or of another recycling material. The feeding apparatus can also be part of a vehicle which is moved over ground and picks up material from the ground. The invention prevents a jam, in particular in an application where the vehicle may take different inclination values during its movement.

DESCRIPTION OF EMBODIMENT

In the following an embodiment of the invention is described with reference to the following figures:

Fig. 1 shows the baler with the feeding apparatus before starting the wrapping procedure with the closing unit in the parking position where the closing unit can be moved linearly;

Fig. 2 shows the baler of Fig. 1 before starting the wrapping procedure with a rotatable closing unit in the parking position;

Fig. 3 shows the baler of Fig. 1 with an embodiment in which the closing unit in the closing position hits the wrapping material laterally;

Fig. 4 shows an alternative embodiment in which the closing unit in the closing position entirely closes the area besides the feeding conveying unit and the wrapping material drops onto the closing unit;

Fig. 5 shows the baler of Fig. 1 with the pushing unit moved into the engaging position;

Fig. 6 shows a slightly different embodiment with a pushing unit plate sloping downwards and forming a bulge in the wrapping material;

Fig. 7 shows the baler with the feeding apparatus where the rotating bale has grasped the wrapping material and both units moving into the parking position.

According to the embodiment, the invention is used in a round baler which creates a round bale in a pressing chamber under pressure. This bale has a cylindrical shape with two round front faces and a circumferential surface. The bale is created from agricultural material (hay, straw, silage or other fodder material). The material is picked up from the ground by a pick-up unit and is fed towards an inlet of

the pressing chamber by means of a rotary rotor and is inserted into the pressing chamber. In one embodiment the picked-up material is cut by several knives of the baler before being inserted into the pressing chamber.

The pressing chamber comprises several conveying units which convey the material along the circumferential wall of the pressing chamber. Each conveying unit comprises a conveying surface which comes in contact with the material and conveys it. The material conveyed under pressure along the circumferential wall forms a growing cylindrical bale which rotates around a bale rotating axis. This bale rotating axis is perpendicular to the two front faces and to the two parallel side walls of the pressing chamber.

Fig. 1 shows a round baler comprising the feeding apparatus according to the invention. The baler is propelled in the travelling direction TD from left to right in Fig. 1. This round baler comprises

- a pick-up unit PUU with tines,
- a feeding unit FU with a star-shaped rotating rotor,
- two driven conveying rollers CR.1, CR.2,
- a driven roller DRo and several idle rollers, among then the idle roller IRo, and
- a pressing belt PB guided around the rollers DRo, IRo, and further idle rollers.

The agricultural material is inserted into the pressing chamber through the nip between the two adjacent conveying rollers CR.1, CR.2. The conveying direction is opposite to the travelling direction TD.

The material in the pressing chamber forms a growing bale B. This bale B is rotated around a rotating axis perpendicular to the drawing plane and anti-clockwise. The rollers CU.1, CU.2 and WU contribute to forming and rotating the bale B.

After the creation of the bale B in the pressing chamber is completed, the bale B has to be wrapped in the pressing chamber with wrapping material. The wrapped bale is ejected out of the pressing chamber. The wrapping material may be a twine, a prefabricated net made of twine or a plastic sheet, e.g., and prevents the bale B from falling apart after being ejected out of the pressing chamber. The wrapping material is stored in a reservoir of the baler being arranged outside of the pressing chamber, e.g. in a reel which can rotate around a reel rotating axis being parallel to the bale rotating axis. In the embodiment the reservoir is arranged angular ahead of the chamber – seen in the travelling direction TD – and above the bale

rotating axis. The distance from the reservoir to the ground is only as large as necessary such that an empty reel can easily be replaced with a new one.

The wrapping material is pulled off from this reel. In the embodiment two driven rollers rotate in different directions and pull the wrapping material which is between these two rollers. In an alternative embodiment the feeding unit is implemented by means of duck bill which grasps and pulls the wrapping material from the reservoir.

In Fig. 1 a reel RL for wrapping material WM is shown. The reel RL is placed such that the reel RL can be rotated around a rotating axis perpendicular to the drawing plane of Fig. 1.The two driven rollers S.1, S.2 pull off the wrapping material WM from the reel RL. It is also possible that only one roller S.1 or S.2 is driven and the other roller S.2 or S.1 is set into rotation by the driven roller. The width of the wrapping material reel RL is sufficient to wrap the entire circumferential surface of the bale B by pulling off wrapping material WM from the reel RL. The reel RL is rotated clockwise around a rotation axis perpendicular to the drawing plane of Fig. 1 and parallel to the rotating axis of the bale B. After having left the space between the two rollers S.1, S.2, a leading portion of the wrapping material WM forms a loose end area LEA which is not guided but freely sags by the force of gravity as the wrapping material WM has a very low stiffness. This loose end area LEA is situated angularly above the chamber and above the inlet N.1 for the wrapping material WM and is - seen in the travelling direction TD - ahead of the chamber. The leading portion LEA increases as long as the rollers S.1, S.2 continue to pull wrapping material WM from the reel RL.

The wrapping material WM is conveyed through an inlet N.1 into the pressing chamber. The lower border of this inlet N.1 is formed by a conveying unit WU which conveys the wrapping material WM towards the rotating bale B. This conveying unit is denoted as the “feeding conveying unit”. This feeding conveying unit WU may comprise a driven roller, a driven endless belt, or a chain conveyor. The feeding conveying unit WU is in contact with the rotating bale B and contributes to forming and rotating the bale B under pressure and to convey the wrapping material WM.

The baler can be operated in a hilly environment. Therefore the baler and in particular the parts shown in the figures may be rotated around a horizontal axis being perpendicular to the drawing plane. Therefore the position of the

increasing loose end area LEA with respect to the inlet N.1, the feeding conveying unit WU, and the feeding unit FU may vary and can differ from that position which is shown in the figures.

After the wrapping material WM is inserted through the inlet N.1 into the pressing chamber, the wrapping material WM is further injected into the space between this feeding conveying unit WU and the rotating bale B and is grasped by the rotating bale B. The rotating bale B now takes the task of pulling off the wrapping material WM from the reservoir RL. Several layers of wrapping material WM are placed around the circumferential surface of the rotating bale B. If the wrapping of the bale B is finished, a cutting arrangement (not shown) severs the wrapping material WM such that the outer layer around the bale B is separated from the wrapping material WM on the reservoir RL.

The feeding conveying unit WU has a conveying surface CS for conveying and rotating the bale B as well as for conveying the wrapping material WM. Preferably the conveying surface CS of the feeding conveying unit WU is provided with several protrusions which extend perpendicular to the conveying direction over the entire width of the conveying surface CS. In the embodiment these protrusions extend parallel to the rotation axis of the roller WU.

Preferably the feeding conveying unit WU is permanently rotated. This is possible as the feeding conveying unit WU rotates the bale B as well as conveys the wrapping material WM towards the inlet N.1.

The feeding conveying unit WU of Fig. 1 is driven clockwise and contributes to rotating the bale B. Several rips on the conveying surface CS of the feeding conveying unit WU protrude from the conveying surface CS and extend along the circumferential surface of the feeding conveying unit WU and perpendicular to the drawing plane of Fig. 1. The rotating feeding conveying unit WU removes debris from the inlet N.1, in particular by means of the protrusions on the conveying surface CS.

The wrapping material WM has to be inserted into the pressing chamber through the inlet N.1, that is the nip between the driven feeding conveying unit WU and the idle role IRo around which the pressing belt PB is guided.

The invention refers to a feeding apparatus for feeding the wrapping material WM towards the inlet N.1. The feeding apparatus feeds wrapping material WM before the wrapping material WM is inserted through the inlet N.1 in the feeding chamber and

into the space between the bale B and the feeding conveying unit WU. The reservoir RL, the wrapping material supplying unit with the rollers S.1, S.2, and the feeding conveying unit WU belong to this feeding apparatus.

The following problems occur during the step of conveying the wrapping material WM towards the inlet N.1 and introducing it into the pressing chamber:

- The sagging wrapping material WM has to be inserted into the pressing chamber through the nip N.1. The wrapping material WM must therefore be guided on its way from the two driven pulling rollers S.1, S.2 to this nip N.1. As the nip N.1 is arranged besides and not above the chamber, this nip N.1 is not arranged vertically below the pressing rollers but angular downwards.
- As the inlet N.1 forms a slot or nip in the circumferential surface of the pressing chamber, the inlet N.1 can only be narrow. Otherwise a lot of material would be pressed out of the pressing chamber through the inlet N.1.
- The position of the leading portion (loose end area) LEA relative to the nip N.1 can vary, in particular if the baler is operated in a hilly environment.
- The leading portion LEA of the wrapping material WM sags down after having left the pulling rollers S.1, S.2. This leading portion LEA must be moved laterally, i.e. horizontally or sloping downwards, in order to hit the inlet N.1. It must be inhibited that the leading portion LEA is grasped by the rotating rotor FU below the pulling rollers S.1, S.2. Fig. 1 shows the area Ar into which the wrapping material WM should not drop. The feeding unit FU with the rotor is situated in this area Ar.
- Debris is rubbed off from the rotating bale B. This debris may be inserted from the chamber into the inlet N.1 for the wrapping material WM and may block this inlet N.1 such that no wrapping material WM can be injected into the pressing chamber. This problem occurs in particular as wrapping material WM having the shape of a net or a twine may be very slack and have only a low stiffness.

To solve these problems the feeding apparatus according to the invention comprises two parts which together guide the wrapping material WM towards the inlet N.1 even in the case of debris in the inlet N.1 and prevents the wrapping material WM from dropping into the area Ar:

- a closing unit CU and

- a pushing unit PU being arranged above the closing unit CU.

In the embodiment the pushing unit PU comprises a plate Pl.PU. The closing unit CU comprises a further plate Pl.CU. Both plates Pl.PU, Pl.CU are made of rigid material, e.g. of steel.

The closing unit CU can be pivoted from a parking position into a closing position and back from the closing position into the parking position. In the closing position the plate Pl.CU of the closing unit CU closes the area Ar entirely or at least partially from above.

The pushing unit PU can be moved from a parking position in an engaging direction ED into an engaging position and back from the engaging position in a disengaging direction into the parking position.

In the embodiment the plate Pl.PU of the pushing unit PU can be moved by a linear movement in the engaging direction ED into the engaging position. The engaging direction ED is horizontal or is sloping downwards. In one embodiment the plate Pl.CU of the closing unit CU can also be moved by a linear movement into the closing position. Fig. 1 shows this embodiment. The pushing unit PU and the closing unit CU are in the parking position. The plate Pl.PU of the pushing unit PU can be moved in a horizontal or sloping direction and in the opposite horizontal direction. The plate Pl.CU of the closing unit CU can be moved in a further horizontal direction and in the opposite direction or can be pivoted into the closing position. All horizontal directions lie in the drawing plane of Fig. 1. A positioning device with two drives Dr.CU, Dr.PU for the two units CU, PU moves both plates Pl.PU, Pl.CU.

Fig. 1 shows the closing unit CU and the pushing unit PU both being in the parking position as well as a drive Dr.PU for the pushing unit PU and a drive Dr.CU for the closing unit CU. As can be seen a distance between the area Ar and the closing unit CU above the area Ar occurs.

Preferably the plate Pl.PU has a width, i.e. a dimension perpendicular to the engaging direction, which is approximately as large as the width of the inlet N.1. Therefore the plate Pl.PU extends along the entire width of the inlet N.1. The plate Pl.CU of the closing unit CU also has a width as large as the inlet N.1.

The plate Pl.PU of the pushing unit PU has a free edge PLE which is the leading edge when the pushing unit PU is moved in the engaging direction ED towards the feeding conveying unit WU. The plate Pl.CU of the closing unit CU has a

free edge CLE which is the leading edge when the closing unit CU is moved into the closing position.

In one embodiment the leading edge PLE of the pushing unit PU has several protrusions. Due to these protrusions the leading edge PLE can have the shape of a comb or a fork. This embodiment guarantees that the leading edge PLE grasps the wrapping material in particular in the case that the wrapping material WM is a net.

In a further embodiment the leading edge PLE has a smooth surface without protrusions. This embodiment reduces the risk that the leading edge PLE penetrates or otherwise damages the wrapping material WM. Such damage may occur if a protrusion of the leading edge PLE hits wrapping material WM having the shape of a plastic sheet.

In one embodiment the leading edge PLE of the plate Pl.PU has the shape of a plane rectangle. In a further embodiment the leading edge PLE has a convex shape. Two different embodiment of a convex shape are possible and can be combined. On the one hand the convex shape occurs seen in a viewing direction parallel to the plate's plane and perpendicular to the engaging direction ED. This embodiment avoids that the plate Pl.PU has a sharp edge which might injure a human or damage the wrapping material WM. On the other hand a convex shape of the leading edge PLE may occur seen in a viewing direction perpendicular to the plate's plane and perpendicular to the engaging direction ED. The central portion of the plate Pl.PU has a smaller distance to the inlet N.1 than the two lateral edged arranged besides the plate Pl.PU. This embodiment helps to shift the wrapping material WM laterally to the left and to the right – seen in the engaging direction ED.

The drives Dr.PU, Dr.CU each comprise a driven teethed wheel engaging corresponding teeth of the unit PU, CU. In one embodiment the teethed wheels of the drives Dr.PU and Dr.CU can move the pushing unit PU as well as the closing unit CU in both directions, i.e. into the engaging position as well as into the parking position.

In a further embodiment the pushing unit PU is connected with a spring Sp.PU (cf. Fig. 3) which urges the plate Pl.PU of the pushing unit PU in the engaging direction ED. The plate Pl.PU of the pushing unit PU can be locked in the parking position. The teethed wheel of the drive Dr.PU moves the plate Pl.PU of the pushing unit PU in the disengaging direction against the force of the spring Sp.PU until the

pushing unit PU is locked in the parking position. For moving the plate Pl.PU of the pushing unit PU in the engaging direction ED the pushing unit PU is unlocked. The spring Sp.PU urges the plate Pl.PU of the pushing unit PU repeatedly into the engaging direction ED. A further spring (not shown) may be provided for moving the plate Pl.CU of the closing unit CU into the closing position.

Fig. 2 shows a further embodiment of the closing unit CU and of pivoting the closing unit CU into the closing position. The plate Pl.CU can be rotated in both directions around a pivoting axis which is perpendicular to the drawing plane of Fig. 2 and perpendicular to the engaging direction ED. In the situation shown in Fig. 2 the closing unit CU is in the parking position. The drive Dr.CU is adapted for rotating the plate Pl.CU of the closing unit CU clockwise around this pivoting axis into the closing position. The plate of the closing unit CU is rigidly mounted on a shaft Sh.CU. The drive Dr.CU rotates the shaft Sh.CU together with the plate Pl.CU around the pivoting axis.

In yet a further embodiment the plate Pl.PU of the pushing unit PU is mounted on two levers. The plate Pl.PU rigidly connects these two levers. The two levers are mounted on a shaft, e.g., and can be rotated around a horizontal rotating axis parallel to the bale's rotating axis. The rotation of the levers moves the plate Pl.PU of the pushing unit in the engaging direction ED into the engaging position or in the disengaging direction into the parking position.

During the step of creating the bale B in the pressing chamber both units CU, PU are in the parking position. The pulling rollers S.1, S.2 and the reel RL do not rotate. The wrapping material WM is not moved. Debris rubbed off from the rotating bale B drops from above into the area Ar and onto the rotor FU and is conveyed back into the pressing chamber.

If the bale creation is terminated, a trigger signal is automatically generated. This trigger signal automatically triggers the execution of the following steps:

- The pulling rollers S.1, S.2 pull off the wrapping material WM from the reservoir RL. For this purpose the pulling rollers S.1, S.2 are set into rotation.
- The plate Pl.CU of the closing unit CU is pivoted from the parking position towards the bale rotating axis and towards the feeding conveying unit WU into the closing position. The pivotal movement of the closing unit CU prevents the wrapping material WM from dropping into the area Ar. In this closing position

the distance between the closing unit CU and the feeding conveying unit WU is smaller than in the parking position.

- Afterwards the plate Pl.PU of the pushing unit PU is moved in the engaging direction ED into the engaging position.

Fig. 3 and Fig. 4 show two different embodiments of the closing unit CU and of its operating mode. Fig. 3 shows an embodiment in which the plate Pl.CU of the closing CU laterally hits the leading portion LEA of the wrapping material WM. Even in the closing position the closing unit CU closes the area Ar only partially. The leading portion LEA passes the closing unit CU. Fig. 4 shows an alternative embodiment in which the plate Pl.CU of the closing unit CU touches the feeding conveying unit WU and closes entirely the area Ar. The closing unit CU comes below the leading portion.

Fig. 3 shows a situation where the drive Dr.CU has shifted or pivoted the plate Pl.CU of the closing unit CU horizontally into the closing position. The leading edge of the wrapping material WM has already passed the leading edge CLE of the closing unit CU. The leading edge CLE hits the leading portion LEA laterally and lifts its lower edge and pushes the leading portion LEA towards the feeding conveying unit WU. By this hitting step the leading portion LEA is prevented from dropping into the area Ar. A gap between the leading edge CLE and the feeding conveying unit WU remains such that the wrapping material WM is not clamped between the closing unit CU and the feeding conveying unit WU.

Fig. 4 shows a situation where the drive Dr.CU has shifted the plate Pl.CU of the closing unit CU laterally into the closing position. The leading edge CLE touches the rotating feeding conveyer unit WU, at least the protruding rips of the rotating feeding conveyer unit WU. Therefore the closing unit CU entirely closes the area Ar. The loose end area LEA cannot drop below the closing unit CU. The rotating feeding conveyer unit WU further continues to clean the inlet N.1 from debris.

The embodiment in which the closing unit CU in the closing position entirely closes the area Ar can be implemented with a closing unit which is rotated around a pivoting axis (cf. Fig. 2) as well as with a closing unit CU which is moved linearly (cf. Fig. 1).

Preferably the leading edge CLE of the closing unit CU is made of an elastic material, e.g. of rubber, such that a close contact between the feeding conveying unit WU and the leading edge CLE can be realized. The elastic leading

edge CLE oscillates when touching the protrusions on the conveying surface. The leading edge CLE can also be shifted laterally away by the feeding conveying unit WU. The feeding conveying unit WU continues to rotate after being touched by the leading edge CLE.

In the embodiment shown in Fig. 4 the leading edge CLE of the closing unit CU reaches the feeding conveying unit WU and touches it before the leading portion LEA reaches the closing unit CU. The plate Pl.CU of the closing unit CU reaches a position below the wrapping material WM before the increasing leading portion LEA reaches the plate Pl.CU. Therefore the wrapping material WM drops onto the plate Pl.CU of the closing unit CU from above and cannot be conveyed in a position where a part of the leading portion (loose end area LEA) of the wrapping material WM is below the closing unit CU. This inhibits the undesired event that the rotating rotor of the feeding unit FU grasps the wrapping material WM. This rotor is arranged below the closing unit CU and in the area Ar. As the closing unit CU entirely covers the area Ar, the leading portion LEA cannot drop into the area Ar independently from the position of the leading portion LEA with respect to the inlet N.1.

In the embodiment of Fig. 4 the plate Pl.CU of the closing unit CU is moved such that it reaches the closing position before the leading edge of the wrapping material WM reaches the closing unit CU.

It is preferable but not necessary that the closing unit CU touches the feeding conveying unit WU. It is further preferable but not necessary that the closing unit CU reaches the closing position before the leading portion LEA reaches the closing unit CU. An essential feature of the embodiment of Fig. 4 is that the closing unit CU comes into a position below the wrapping material WM before the leading portion LEA reaches the upper surface of the closing unit CU. This arrangement has the effect that the closing unit CU blocks the downward path of the leading portion LEA and inhibits the leading portion LEA from dropping or being moved into the area Ar.

The following description refers to the embodiment of Fig. 3 as well as of that of Fig. 4. After the closing unit CU has been pivoted into the closing position and the leading portion LEA of the wrapping material WM has reached the closing unit CU in the closing position, the plate Pl.PU of the pushing unit PU is moved laterally from the parking position into the engaging position. The pushing unit PU

performs a quick movement of the plate Pl.PU in the engaging direction ED. Preferably the pushing unit PU performs a purely translational movement.

The plate Pl.PU of the pushing unit PU hits the wrapping material WM such that a foremost part of the leading portion LEA of the wrapping material WM is below the plate Pl.PU and the rest of the wrapping material WM is above the plate Pl.PU of the pushing unit PU. Preferably the leading edge PLE hits the loose end area LEA such that the lower edge of the loose end area LEA is at least 20 cm below the leading edge PLE in the moment of hitting. By being hit the portion of the wrapping material WM being below the leading edge PLE is lifted – like a curtain before a window which is hit laterally. This causes the wrapping material WM to be shifted laterally towards the bale rotating axis and towards the feeding conveying unit WU. The term "shifting laterally" refers to the vertical direction of the sagging loose end area LEA.

The movement of the plate Pl.PU has two different effects:

- The loose end area LEA is shifted laterally.
- The inlet N.1 is cleaned by the plate Pl.PU such that no jam can occur.

The cleaning function of the pushing PU is achieved as the rigid plate Pl.PU pushes debris and other material towards the inlet N.1. Preferably the plate Pl.PU engages into the inlet N.1 during its movement in the engaging direction ED. This debris drops downwards or is pushed through the inlet N.1 into the pressing chamber and cannot inhibit the wrapping material WM from being injected through the inlet N.1 into the chamber. Preferably the width of the plate Pl.PU is as large as the width of the inlet N.1 such that the entire width of the inlet N.1 is cleaned.

In one embodiment the leading edge PLE of the pushing unit PU has a convex shape seen in a viewing direction perpendicular to the plate's plane. The central part of the plate PL.PU has a smaller distance to the inlet N.1 than the two lateral edges of the plate Pl.PU. This embodiment urges the wrapping material WM to be shifted laterally not only with respect to the vertical sagging direction but also with respect to the engaging direction ED. The term "shifting laterally" therefore can also refer to the engaging direction ED. Due to the convey shape the wrapping material WM is shifted to the left and to the right seen in the engaging direction ED. The effect is that along the entire width of the inlet N.1 wrapping material WM is inserted into the pressing chamber. The entire circumferential surface of the rotating

bale B is wrapped and no area adjacent to a front face of the bale B remains unwrapped.

As just mentioned the pushing unit PU shifts laterally the loose end area LEA towards the inlet N.1. In one embodiment the pushing unit PU shifts the loose end area LEA such that the wrapping material WM is tensioned in the area between the leading edge PLE of the pushing unit PU and the two rollers S.1, S.2 of the wrapping material supplying unit. This embodiment can in particular be implemented

- if the leading edge PLE has the shape of a comb or a fork,
- if the wrapping material WM is a net and
- if the plate Pl.PU is moved quickly enough.

In a further embodiment the loose end area LEA is not tensioned until the wrapping material WM reaches the space between the rotating bale B and the roller WU. Such a tension might stress the wrapping material WM. This further embodiment can in particular be implemented with a plane leading edge PLE of the pushing unit PU, i.e. a leading edge PLE without protrusions. Such protrusions can damage wrapping material WM which has the form of a plastic sheet.

In order to avoid a tension between the leading edge PLE and the rollers S.1, S.2 the following parameters are set in a proper way:

- The circumferential velocity of the rollers S.1, S.2 is sufficiently large such that the leading portion LEA increases sufficiently enough. In one embodiment the velocity of the circumferential surface of the rollers S.1, S.2 is larger than the velocity of the linear movement of the pushing unit PU in the engaging direction ED.
- The plate Pl.PU hits the wrapping material WM so late that the loose end area LEA is sufficiently long enough. In particular the portion of the loose end area LEA between the rollers S.1, S.2 and the leading edge PLE is sufficiently long such that it is not tensioned by the plate Pl.PU.

This embodiment in which a tension of the loose end area LEA is avoided can be combined with an embodiment in which the leading edge PLE has no protrusions and has a surface with a low friction coefficient. Therefore only a low friction between the pushing unit PU and the wrapping material WM occurs.

Fig. 5 shows a situation where the drive Dr.PU has shifted the plate Pl.PU of the pushing unit PU laterally and horizontally in the engaging direction ED.

The leading edge PLE of the pushing unit PU has reached the loose end area LEA and is shifting this loose end area LEA towards the inlet N.1. The feeding conveying unit WU has grasped the leading edge LEA of the wrapping material WM and is going to inject it through the inlet N.1 into the pressing chamber. The closing unit CU is still in the closing position. Fig. 5 shows an embodiment in which the leading edge CLE touches the feeding wrapping unit WU. The situation shown in Fig. 5 can also be achieved if a gap between the closing unit CU and the feeding conveying unit WU remains, in particular with a closing unit CU which hits laterally the leading portion LEA, cf. Fig. 3.

In this embodiment the leading edge PLE of the pushing unit PU preferably has several protrusions, e.g. has the shape of a comb. The leading edge PLE grasps the wrapping material WM during the movement in the engaging direction ED. In order to guide and directed to the inlet N.1.

The feeding conveying unit WU conveys the wrapping material WM towards the inlet N.1 for the wrapping material WM. The protrusions on the conveying surface CS help to convey the leading portion LEA of the wrapping material WM. The rotating bale B grasps the wrapping material WM. The feeding conveying unit WU now contributes to pulling off the wrapping material WM from the reservoir RL. The pulling rollers S.1, S.2 are switched off again and now operate as idle wheels which are rotated by the wrapping material WM.

After the rotating bale B has grasped the wrapping material WM, the closing unit CU and the pushing unit PU are retracted, i.e. pivoted and moved back into the parking position. This movement is performed by the drives Dr.PU and Dr.CU. The two units CU, PU can be retracted simultaneously or one behind the other.

Fig. 6 shows a slightly different embodiment of the pushing unit PU. The basic idea of the embodiment shown in Fig. 6 is that the pushing unit PU forms a bulge in the loose end area LEA and pushes this bulge into the inlet N.1.

The plate Pl.PU of the pushing unit PU is not necessarily moved horizontally but moved such that the engaging direction ED is perpendicular to the nip N.1 and to the surface of the rotating bale B. In the embodiment the engaging direction ED is therefore sloping downwards. The leading edge PLE of the pushing unit PU penetrates the inlet N.1. In one embodiment the leading edge PLE nearly touches the surface of the rotating bale B when having reached the engaging

position. This embodiment further reduces the risk that debris in the inlet N.1 forms an obstacle for inserting the wrapping material WM through the inlet N.1 into the pressing chamber. The rigid plate Pl.PU cleans the entire inlet N.1 by pushing debris being in the inlet N.1 into the pressing chamber. The plate Pl.CU of the closing unit CU is also in this embodiment horizontal when being in the closing position.

The apparatus of this embodiment operates as follows: First the closing unit CU is pivoted into the closing position. The leading edge of the loose end area LEA touches the upper surface of the plate Pl.CU, cf. the embodiment of Fig. 4. In the embodiment of Fig. 6 a gap between the leading edge CLE of the closing unit CU and the feeding conveying unit WU remains. Nevertheless the closing unit CU inhibits the loose end area LEA from dropping into the area Ar. The embodiment of Fig. 6 can also be combined with a version where the leading edge CLE touches the conveying surface CS of the feeding conveying unit WU.

The drive Dr.PU now moves the plate Pl.PU of the pushing unit PU in the engaging direction ED sloping downwards and into the nip N.1. The loose end area LEA has a lower edge. The loose end area LEA is not tensioned but is slack. The plate Pl.PU hits the loose end area LEA in a position above the lower edge. Preferably the plate Pl.PU hits the loose end area LEA such that a distance of at least 20 cm between the lower edge and the leading edge PLE occurs. The laterally moved plate Pl.PU forms a bulge into the loose end area LEA of the wrapping material WM. This bulge is pushed into the inlet N.1. In one embodiment the plate Pl.PU urges a top area of the bulge against the rotating bale B when having reached the engaging position. This top area is pressed against the surface of the bale B.

Two layers of the wrapping material WM are simultaneously injected through the inlet N.1 into the space between the rotating feeding conveying unit WU and the rotating bale B. These two layers are simultaneously grasped by the rotating bale B. The bale B does not grasp the lower edge of the wrapping material WM but two layers of an intermediate portion of the loose end area LEA. This embodiment even increases the probability that the wrapping material WM is grasped by the rotating bale.

Fig. 7 shows a situation where one layer of wrapping material WM is already placed around the rotating bale B. An intermediate area TA of the wrapping material WM occurs and extends between the rollers S.1, S.2 and the feeding supplying unit WU. The bale B and the feeding conveying unit WU on the one side

and the two rollers S.1, S.2 on the other side provide a tension for the intermediate area TA of the wrapping material WM which serves as a tension area. The rollers S.1, S.2 are no longer driven by a drive but are driven by the wrapping material WM. In the embodiment the wrapping material WM is tensioned after having being inserted into the pressing chamber but is not tensioned earlier.

The rollers S.1, S.2 provide a mechanical resistance. The wrapping material WM is pulled off against this resistance. The resistance yields the effect that the wrapping material WM is tensioned in the tension area TA. In particular the tension inhibits that the wrapping material WM can drop into the area Ar after the closing unit CU and the pushing unit PU are retracted into the parking position.

In the situation shown in Fig. 7 the drive Dr.CU has retracted the closing unit CU from the closing position to the parking position. The drive Dr.PU is just retracting the pushing unit PU in a disengaging direction from the engaging position into the parking position. By retracting the plate Pl.CU of the closing unit CU and the plate Pl.PU of the pushing unit PU the area Ar is released again. The retraction of the closing unit CU is performed because material rubbed off from the bale B can drop onto the feeding unit FU and is conveyed back into the pressing chamber or drops onto the ground. The retraction of the plate Pl.PU of the pushing unit PU is performed such that the pushing unit PU can be moved again in the engaging direction ED later and during the step of wrapping the next bale.

In one embodiment the upper surfaces of the plate Pl.CU of the closing unit CU and of the plate Pl.PU of the pushing unit PU are cleaned during the step of retracting these plates Pl.CU, Pl.PU into the respective parking position. Fig. 5 shows a cleaning element Cl.CU for the closing unit CU which cleans the upper surface of the plate Pl.CU while the closing unit CU is retracted. Fig. 5 shows a cleaning element Cl.PU for the pushing unit PU which cleans the upper surface of the plate Pl.PU while the pushing unit PU is retracted. In one embodiment every cleaning element Cl.CU, Cl.PU comprises a brush. The two cleaning elements Cl.CU, Cl.PU can be moved vertically into a cleaning position and into a parking position. It is possible but not necessary to move the cleaning elements Cl.CU, Cl.PU horizontally.

List of reference signs

CLE	leading edge of the closing unit CU
Cl.CU	cleaning element for the closing unit CU

Cl.PU	cleaning element for the pushing unit PU
CR.1, CR.2	conveying rollers, rotate the bale B
CS	conveying surface of the conveying unit WU
CU	closing unit, comprises the plate Pl.CU and the drive Dr.CU
Dr.CU	drive for the closing unit CU
Dr.PU	drive for the pushing unit PU
ED	engaging direction of the pushing unit PU
FU	feeding unit with a rotating rotor
IRo	idle roller besides the inlet N.1
LEA	loose end area of the wrapping material WM, sags down
N.1	nip between the feeding conveying unit WU and the idle roller IRo, serves as an inlet for the wrapping material WM.
PB	pressure belt, is guided around the driven roller DRo and several idle rollers, among them the idle roller IRo.
PLE	leading edge of the pushing unit PU
Pl.CU	plate of the closing unit CU
Pl.PU	plate of the pushing unit PU
PU	pushing unit, comprises the plate Pl.PU and the drive Dr.PU
PUU	pick-up unit
RL	reel of wrapping material WM, operates as a reservoir
S.1, S.2	driven rollers, pulls wrapping material WM from the reel RL
Sh.CU	shaft on which the plate Pl.CU of the closing unit CU is mounted, can be rotated around its longitudinal axis by the drive Dr.CU
Ar	area besides the feeding conveying unit WU into which the wrapping material WM must not drop
Sp.PU	spring of the drive for the pushing unit PU, shifts the pushing unit PU rapidly into the engaging direction ED
TA	intermediate tension area in which the wrapping material WM is tensioned, extends between the wrapping material supply rollers S.1, S.2 and the inlet N.1
TD	travelling direction of the baler
WM	wrapping material for wrapping the rotating bale B

WU	feeding conveying unit in the form of a roller, conveys the wrapping material WM towards the inlet N.1

Conclusies

1. Toevoerinrichting voor het toevoeren van wikkelmateriaal (WM) naar een inlaat (N.1) van een kamer in welke kamer een voorwerp (B) omwikkeld dient te worden met wikkelmateriaal (WM), waarbij de toevoerinrichting omvat:
een wikkelmateriaalvoorraadeenheid (S.1, S.2),
waarbij de wikkelmateriaalvoorraadeenheid (S.1, S.2) in een toevoerstand kan werken, waarbij de wikkelmateriaalvoorraadeenheid (S.1, S.2) in de toevoerstand is aangepast voor het toevoeren van wikkelmateriaal (WM) vanuit een reservoir (RL),
een afsluiteenheid (CU) die in en afsluitpositie kan werken,
een duweenheid (PU) die bewogen kan worden in een aangrijprichting (ED) in de richting van de inlaat (N.1),
een duweenheidaandrijving (Dr.PU) voor het bewegen van de duweenheid (PU) in de aangrijprichting (ED),
waarbij de wikkelmateriaalvoorraadeenheid (S.1, S.2) werkend in de toevoerstand ingericht is voor het zodanig toevoeren van wikkelmateriaal (WM) dateen voorlopend deel van het wikkelmateriaal een doorhangend los eindgedeelte (LEA) vormt, waarbij het losse eindgedeelte (LEA) in een positie tussen de duweenheid (PU) en de inlaat (N.1) komt, en
het losse eindgedeelte (LEA) groter wordt tot dat het wikkelmateriaal (WM) de kamer heeft bereikt, waarbij
de toevoerinrichting is zodanig aangebracht dat de afsluiteenheid (CU) onder de duweenheid (PU) is aangebracht, waarbij
de afsluiteenheid (CU) in de afsluitpositie ten minste gedeeltelijk een ruimte (Ar) buiten de kamer en naast en/of onder de wikkelmateriaaltoevoereenheid (WU) afsluit,
de afsluiteenheid (CU) in de afsluitpositie daardoor voorkomt dat het losse eindgedeelte (LEA) in de ruimte (Ar) valt, en
de duweenheid (PU) is aangepast voor het duwen van het losse eindgedeelte (LEA) naar de inlaat (N.1) indien de duweenheid (PU) in de aangrijprichting (ED) wordt bewogen.

2. Toevoerinrichting volgens conclusie 1, **met het kenmerk dat** duweenheid (PU) een plaat (Pl.PU) omvat,

welke plaat (Pl.PU)

- beweegbaar is in de aangrijprichting (ED), en
- horizontaal is of schuin afloopt in de richting van de inlaat (N.1) als de afsluiteenheid (CU) in de afsluitpositie is.

3. Toevoerinrichting volgens conclusie 0 (vert: 2) **met het kenmerk dat** de plaat (Pl.PU) een bovenoppervlak heeft en de toevoerinrichting zodanig is ingericht dat het los doorhangende losse eindgedeelte (LEA) van het wikkelmateriaal (WM) op het bovenoppervlak van de plaat (Pl.PU) wordt geplaatst voordat het losse eindgedeelte (LEA) door de duweenheid (PU) wordt geduwd.

4. Toevoerinrichting volgens één van de voorgaande conclusies, **met het kenmerk dat** de toevoerinrichting verder een wikkelmateriaaltoevoereenheid (WU) omvat, waarbij de wikkelmateriaaltoevoereenheid (WU) een oppervlak (CS) heeft voor het transporteren van het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) in de richting van de inlaat (N.1),

waarbij de toevoerinrichting zodanig is ingericht dat de wikkelmateriaaltoevoereenheid (WU) zich bevindt tussen

- de inlaat (N.1) en
- de ruimte (Ar) die ten minste gedeeltelijk afgedekt is door de afsluiteenheid (CU) in de afsluitpositie.

5. Toevoerinrichting volgens één van de voorgaande conclusies, **met het kenmerk dat** de duweenheid (PU) een vrije rand (PLE) heeft, waarbij deze vrije rand (PLE) als de voorlopende rand van de duweenheid (PU) werkt als de duweenheid (PU) in de aangrijprichting (ED) wordt bewogen, en waarbij de toevoerinrichting zodanig is aangepast dat de voorlopende rand (PLE) van de duweenheid (PU) het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) raakt terwijl de duweenheid (PU) in de aangrijprichting (ED) wordt bewogen.

6. Toevoerinrichting volgens één van de voorgaande conclusies, **met het kenmerk dat** de duweenheid (PU) in een loskoppelrichting bewogen kan worden die tegenovergesteld is aan de aangrijprichting (ED) ,

waarbij de duweenheidaandrijving (Dr.PU) verder is aangepast voor het bewegen van de duweenheid (PU) in de loskoppelrichting.

7. Toevoerinrichting volgens conclusie 0 (vert: 6), **met het kenmerk dat** de inrichting een duweenheidreinigingselement (Cl.PU) omvat, waarbij

een rand van het duweenheidreinigingselement (Cl.PU) naar een reinigingspositie bewogen kan worden, zo dat deze rand van het duweenheidreinigingselement (Cl.PU) de duweenheid (PU) van bovenaf raakt, en dat de inrichting is aangepast voor het bewegen van het duweenheidreinigingselement (Cl.PU) naar de reinigingspositie als de duweenheid (PU) in de loskoppelrichting wordt bewogen, zo dat materiaal op het bovenoppervlak van de duweenheid (PU) van het bovenoppervlak wordt verwijderd.

8. Toevoerinrichting volgens één van de voorgaande conclusies, **met het kenmerk dat** de duweenheid (PU) is aangepast voor het raken en duwen van het losse eindgedeelte (LEA), zodanig dat

- een bult gevormd wordt in het losse eindgedeelte (LEA),
- de bult in de inlaat (N.1) wordt verschoven, en
- twee lagen wikkelmateriaal (WM) door het gat (N.1) de kamer in worden gebracht.

9. Toevoerinrichting volgens één van de voorgaande conclusies, **met het kenmerk dat** de afsluiteenheid (CU) zwenkbaar is aangebracht zodat de afsluiteenheid (CU) van de afsluitpositie naar een parkeerpositie en terug van de parkeerpositie naar de sluitpositie gezwenkt kan worden waarbij de afsluiteenheid (CU) de ruimte (Ar) naast en/of onder de wikkelmateriaaltoevoereenheid (WU) vrijgeeft, in de parkeerpositie zodat het materiaal in deze ruimte (Ar) kan vallen.

10. Toevoerinrichting volgens conclusie 0 (vert: 9) **met het kenmerk dat** de afsluiteenheid (CU) naar de afsluitpositie gezwenkt kan worden door gezwenkt te worden om een zwenkas (Sh.CU).

11. Toevoerinrichting volgens conclusie 0 (vert: 9) of conclusie 0 (vert: 10), **met het kenmerk dat** de afsluiteenheid (CU) naar de afsluitpositie gezwenkt kan worden door lineair bewogen te worden.

12. Toevoerinrichting volgens één van de conclusies 0 (vert: 9) tot 0 (vert: 11), **met het kenmerk dat** de toevoerinrichting verder een afsluiteenheidaandrijving (Dr.CU) omvat voor het zwenken van de afsluiteenheid (CU) naar de afsluitpositie en naar de parkeerpositie.

13. Toevoerinrichting volgens een van de conclusies 0 (vert: 9) tot 0 (vert: 12), **met het kenmerk dat** de toevoerinrichting is ingericht voor

- het eerst zwenken van de afsluiteenheid (CU) naar de afsluitpositie en
- het daarna bewegen van de duweenheid (PU) in de aangrijprichting (ED).

14. Toevoerinrichting volgens conclusie 0 (vert: 12) of 0 (vert: 13), **met het kenmerk dat** de toevoerinrichting verder een wikkelmateriaaltoevoereenheid (WU) omvat, waarbij de wikkelmateriaaltoevoereenheid (WU) een oppervlak (CS) heeft voor het transporteren van het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) naar de inlaat (N.1), en dat de afsluiteenheid een vrije rand (CLE) heeft, waarbij de vrije rand (CLE) van de afsluiteenheid (CU) werkt als de voorlopende rand van de afsluiteenheid (CU) als de afsluiteenheid (CU) in de afsluitpositie is gezwenkt, en de toevoerinrichting zodanig is aangepast dat de voorlopende rand (CLE) van de afsluiteenheid (CU) het oppervlak (CS) van de wikkelmateriaaltoevoereenheid (WU) raakt als de afsluiteenheid (CU) in de afsluitpositie is gezwenkt.

15. Toevoerinrichting volgens conclusie 0 (vert: 14), **met het kenmerk dat** de duweenheid (PU) een vrije rand (PLE) heeft, waarbij de vrije rand (PLE) van de duweenheid (PU) werkt als een voorlopende rand van de duweenheid (PU) als de duweenheid (PU) in de aangrijprichting (ED) bewogen wordt, en de toevoerinrichting zodanig is ingericht dat

- eerst de voorlopende rand (CLE) van de afsluiteenheid (CU) het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) raakt
- en dat daarna de voorlopende rand (PLE) van de duweenheid (PU) het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) raakt.

16. Toevoerinrichting volgens een van de conclusies 0 (vert: 9) tot 0 (vert: 15), **met het kenmerk dat** de toevoerinrichting een afsluiteenheidreinigingselement (Cl.CU) omvat, waarbij een rand van het sluiteenheidreinigingselement (Cl.CU) naar een reinigingspositie bewogen kan worden zodanig dat deze rand van het sluiteenheidreinigingslement (Cl.CU) de sluiteenheid (CU) van bovenaf raakt, in de afsluitpositie en dat de toevoerinrichting is aangepast voor het naar de reinigingspositie bewegen van het afsluiteenheidreinigingselement (Cl.CU) als de afsluiteenheid (CU) in de parkeerpositie gezwenkt is zodat materiaal op het bovenoppervlak van de sluiteenheid (CU) van dit bovenoppervlak verwijdert wordt.

17. Wikkelinrichting omvattende een kamer waarin een voorwerp (B) omwikkeld dient te worden met wikkelmateriaal (WM), een inlaat (N.1) waardoor wikkelmateriaal (WM) in de kamer kan worden gebracht, en een toevoerinrichting

volgens één van de voorgaande conclusies voor het toevoeren van wikkelmateriaal (WM) naar de inlaat (N.1).

18. Voertuig omvattende de wikkelinrichting volgens conclusie 0 (vert: 17), waarbij het voertuig is ingericht

- om bewogen te worden over de grond
- voor het oppakken van materiaal van de grond
- voor het maken van een voorwerp (B) in de kamer van het opgepakte materiaal, en
- voor het omwikkelen van het in de kamer gemaakte voorwerp (B).

19. Werkwijze voor toevoeren van wikkelmateriaal (WM) naar een inlaat (N.1) van een kamer, in welke kamer een voorwerp (B)omwikkeld dient te worden met wikkelmateriaal (WM), waarbij de werkwijze de automatisch uitgevoerde stappen omvat dat, wikkelmateriaal wordt toegevoerd vanuit een reservoir (RL) zodanig dat

- een voorlopend deel van het wikkelmateriaal (WM) een meehangend los eindgedeelte (LEA) vormt,
- het losse eindgedeelte (LEA) in een positie tussen de duweenheid (PU) en de inlaat (N.1) komt, en
- het neerhangend losse eindgedeelte (LEA) groter wordt tot het wikkelmateriaal (WM) de kamer heeft bereikt en dat een duweenheid (PU) wordt bewogen in een ingrijprichting (ED) naar de inlaat (N.1) zodanig dat de duweenheid (PU) het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) raakt en dit naar de inlaat (N.1) duwt terwijl de duweenheid (PU) wordt verplaatst in de aangrijprichting (ED) en dat de afsluiteenheid (CU) in de afsluitpositie ten minste gedeeltelijk een ruimte (Ar) een afsluiteenheid (CU) die onder duweenheid (PU) is aangebracht wordt tenminste tijdelijk in een sluitpositie afsluit die zich buiten de kamer en naast en/of onder de wikkelmateriaaltoevoereenheid (WU), bevindt, en dat de sluiteenheid (CU) voorkomt dat het losse eindgedeelte (LEA) in de ruimte (Ar) valt.

20. Werkwijze volgens conclusie 0 (vert: 19), **met het kenmerk dat** de afsluiteenheid (CU) zwenkbaar is aangebracht, dat de afsluiteenheid (CU) de afsluitpositie gezwenkt wordt voordat het wikkelmateriaal (WM) de inlaat (N.1) heeft bereikt, en dat de duweenheid (PU) het losse eindgedeelte (LEA) duwt nadat de afsluiteenheid (CU) naar de afsluitpositie is gezwenkt.

21. Werkwijze volgens conclusie 0 (vert: 20), **met het kenmerk dat** een vrije rand (PLE) van de duweenheid (PU) werkt als de voorlopende rand van de duweenheid (PU) terwijl de duweenheid (PU) in de aangrijprichting (ED) wordt bewogen, waarbij de werkwijze de verdere stap omvat dat de voorlopende rand (PLE) van de duweenheid (PU) het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) raakt, en dat dit raken gebeurt terwijl de duweenheid (PU) in de aangrijprichting (ED) wordt bewogen en nadat de afsluiteenheid (CU) de afsluitpositie heeft bereikt.

22. Werkwijze volgens conclusie 0 (vert: 21), **met het kenmerk dat** een vrije rand (CLE) van de afsluiteenheid (CU) werkt als de voorlopende rand van de afsluiteenheid (CU) terwijl de afsluiteenheid (CU) naar de afsluitpositie gezwenkt wordt, en dat de werkwijze de verdere stap omvat dat de voorlopende rand (CLE) van de afsluiteenheid (CU) het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) raakt voordat de voorlopende rand (PLE) van de duweenheid (PU) het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) raakt.

23. Werkwijze volgens een van de conclusies 0 (vert: 20) tot 0 (vert: 22), **met het kenmerk dat** de stap van het toevoeren van wikkelmateriaal (WM) naar de inlaat (N.1) de stap omvat dat een wikkelmateriaaltoevoereenheid (WU) het losse eindgedeelte (LEA) naar de inlaat (N.1) transporteert, en dat deze stap van het zwenken van de afsluiteenheid (CU) naar de afsluitpositie de stappen omvat dat de afsluiteenheid (CU)

- naar een positie wordt gezwenkt waarin de afsluiteenheid (CU) de wikkelmateriaaltoevoereenheid (WU) raakt en
- wordt gestopt wanneer deze raakpositie is bereikt.

24. Werkwijze volgens een van de conclusies 0 (vert: 20) tot 0 (vert: 23), **met het kenmerk dat** de werkwijze verder de stappen omvat dat de afsluiteenheid (CU) zodanig gezwenkt wordt dat het de afsluitpositie bereikt voordat het losse eindgedeelte (LEA) de afsluiteenheid (CU) bereikt, en dat het neerhangende losse eindgedeelte (LEA) van het wikkelmateriaal (WM)

- op een bovenoppervlak van de afsluiteenheid (CU) geplaatst wordt en
- daarna door de duweenheid (PU) naar de inlaat (N.1) geduwd wordt.

25. Werkwijze volgens een van de conclusies 0 (vert: 20) tot 0 (vert: 24), **met het kenmerk dat** de stap van het zwenken van de afsluiteenheid (CU) naar

de afsluitpositie de stap omvat dat de afsluiteenheid (CU) rond een zwenkas (Sh.CU) geroteerd wordt.

26. Werkwijze volgens een van de conclusies 0 (vert: 20) tot 0 (vert: 25), **met het kenmerk dat** de stap van het zwenken van de afsluiteenheid (CU) naar de afsluitpositie wordt uitgevoerd voordat de stap van het bewegen van de duweenheid (PU) in de aangrijprichting (ED) is gestart.

27. Werkwijze volgens een van de conclusies 0 (vert: 19) tot 0 (vert: 25), **met het kenmerk dat** nadat de duweenheid (PU) het losse eindgedeelte (LEA) heeft geraakt, een transportoppervlak (CS) van een wikkelmateriaaltoevoereenheid (WU) het losse eindgedeelte (LEA) van het wikkelmateriaal (WM) naar de inlaat (N.1) transporteert.

28. Werkwijze voor het omwikkelen van een voorwerp (B) in een kamer met een inlaat (N.1), waarbij de werkwijze de stappen omvat dat

- wikkelmateriaal (WM) naar de inlaat (N.1) wordt gevoerd
- door het toepassen van een werkwijze volgens een van de conclusies 0 (vert: 19) tot 0 (vert: 27)
- en dat het wikkelmateriaal (WM) wordt ingebracht door de inlaat (N.1) de kamer in, en
- dat het voorwerp (B) in de kamer is omwikkeld in het ingebrachte wikkelmateriaal (WM).

29. Werkwijze volgens conclusie 0 (vert: 28), **met het kenmerk dat** het voorwerp in de kamer wordt gevormd, en dat de duweenheid (PU) en de afsluiteenheid (CU) zich beiden in de parkeerpositie bevinden terwijl het voorwerp (B) in de kamer wordt gevormd, en dat de gebeurtenis dat het vormen van het voorwerp (B) in de kamer is voltooid de startimpuls geeft voor de twee stappen dat

- de afsluiteenheid (CU) naar de afsluitpositie gezwenkt wordt en
- de duweenheid in de aangrijprichting (ED) wordt bewogen.

FIG. 1

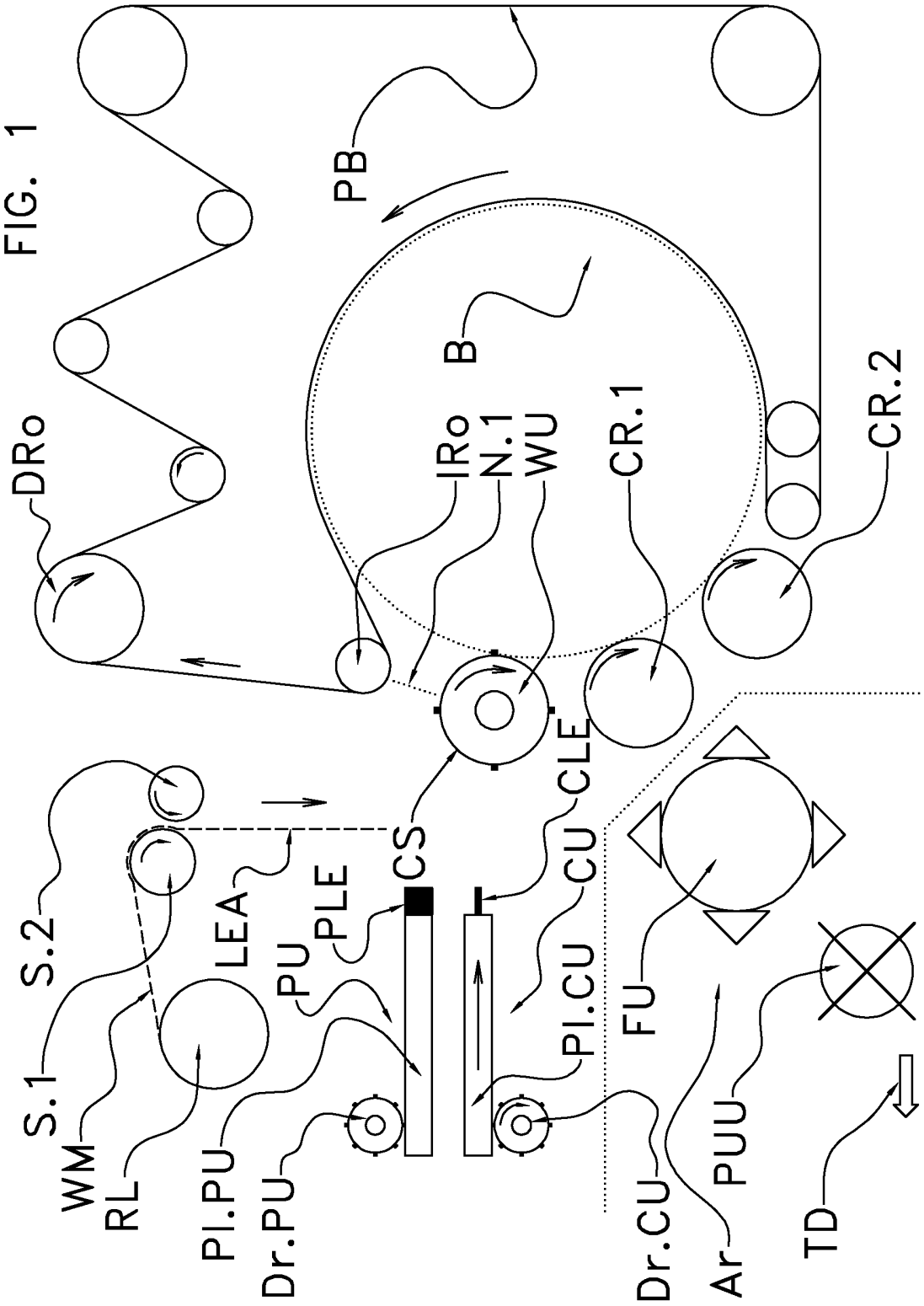
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FIG. 2

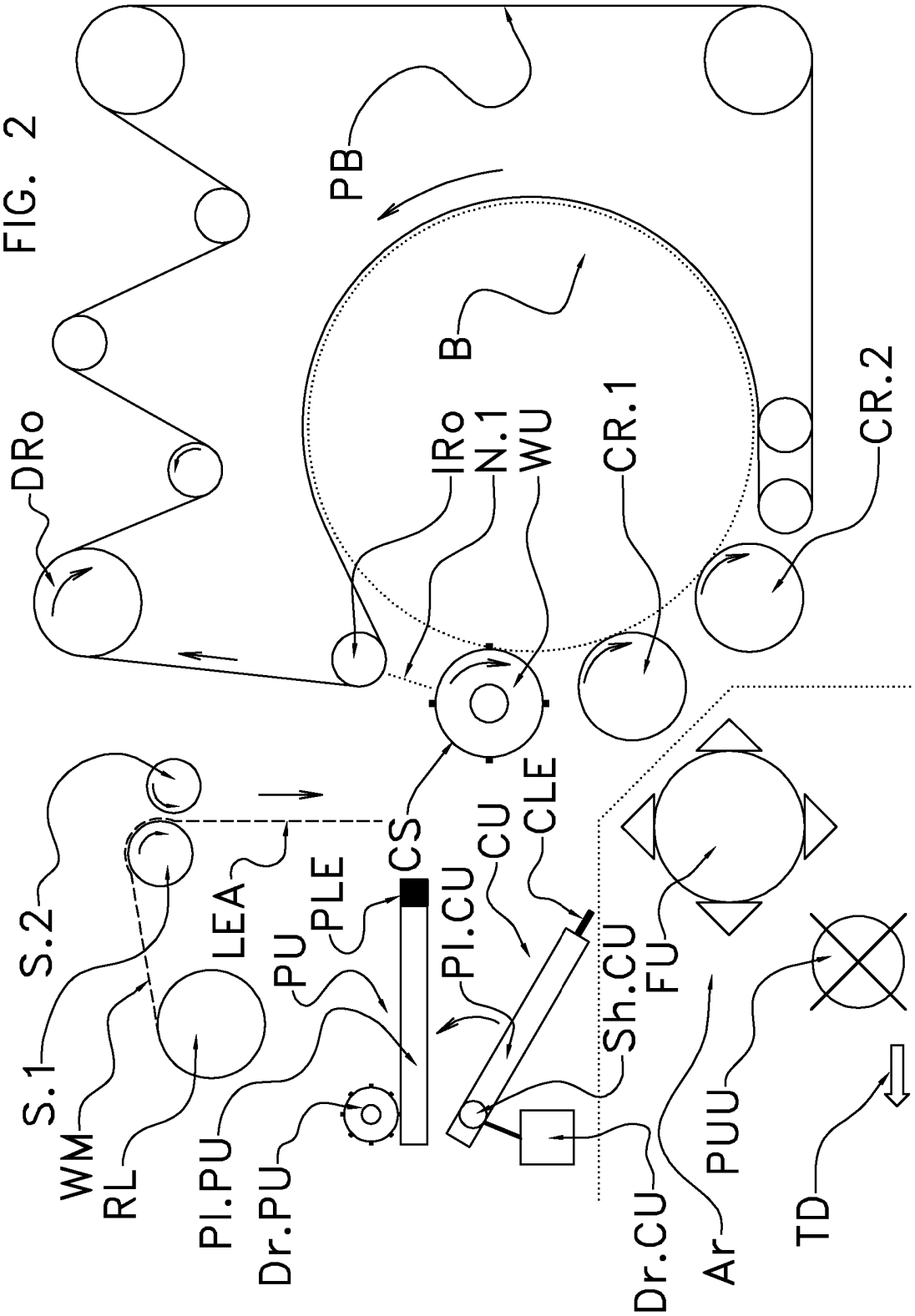
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FIG. 3

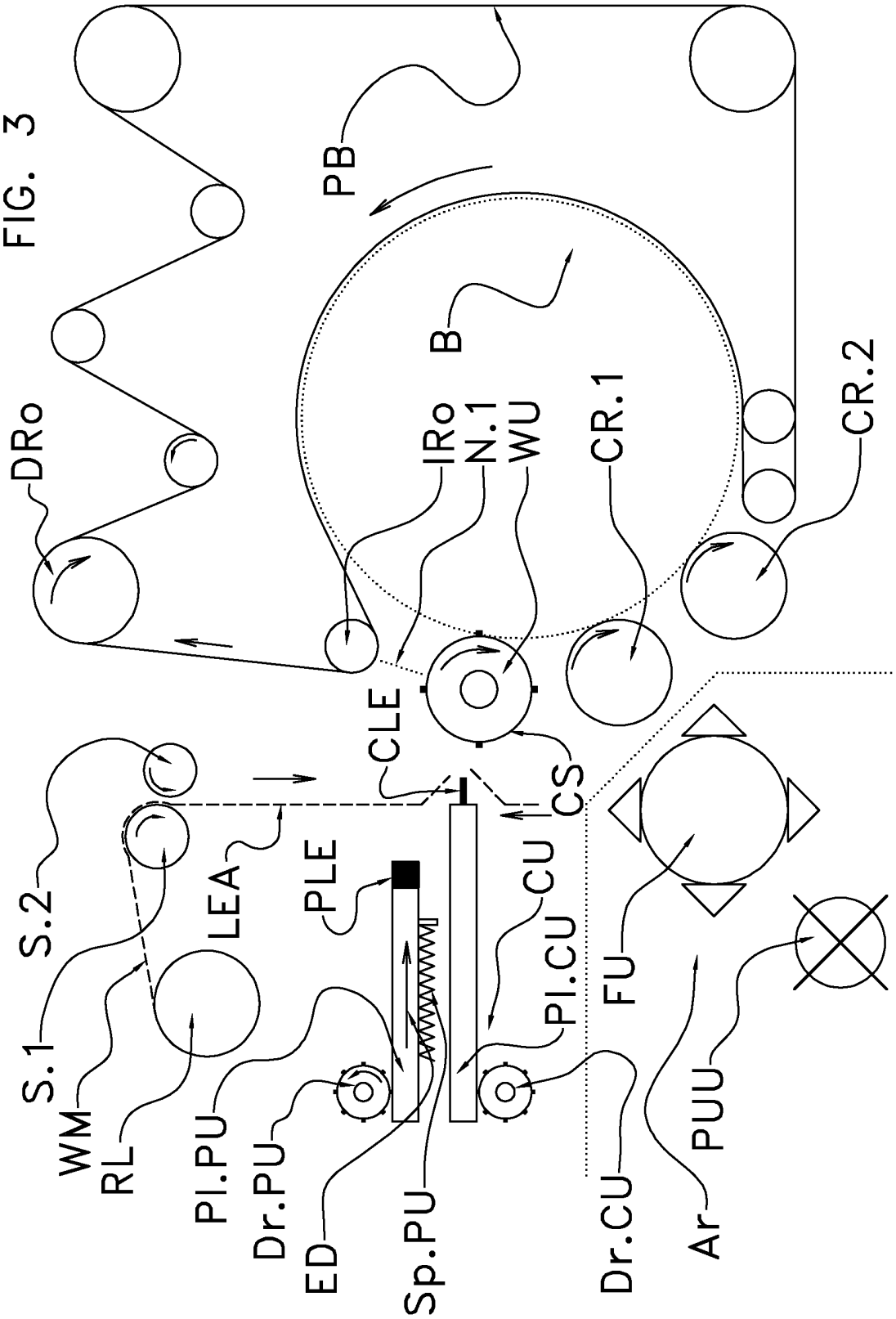
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FIG. 4

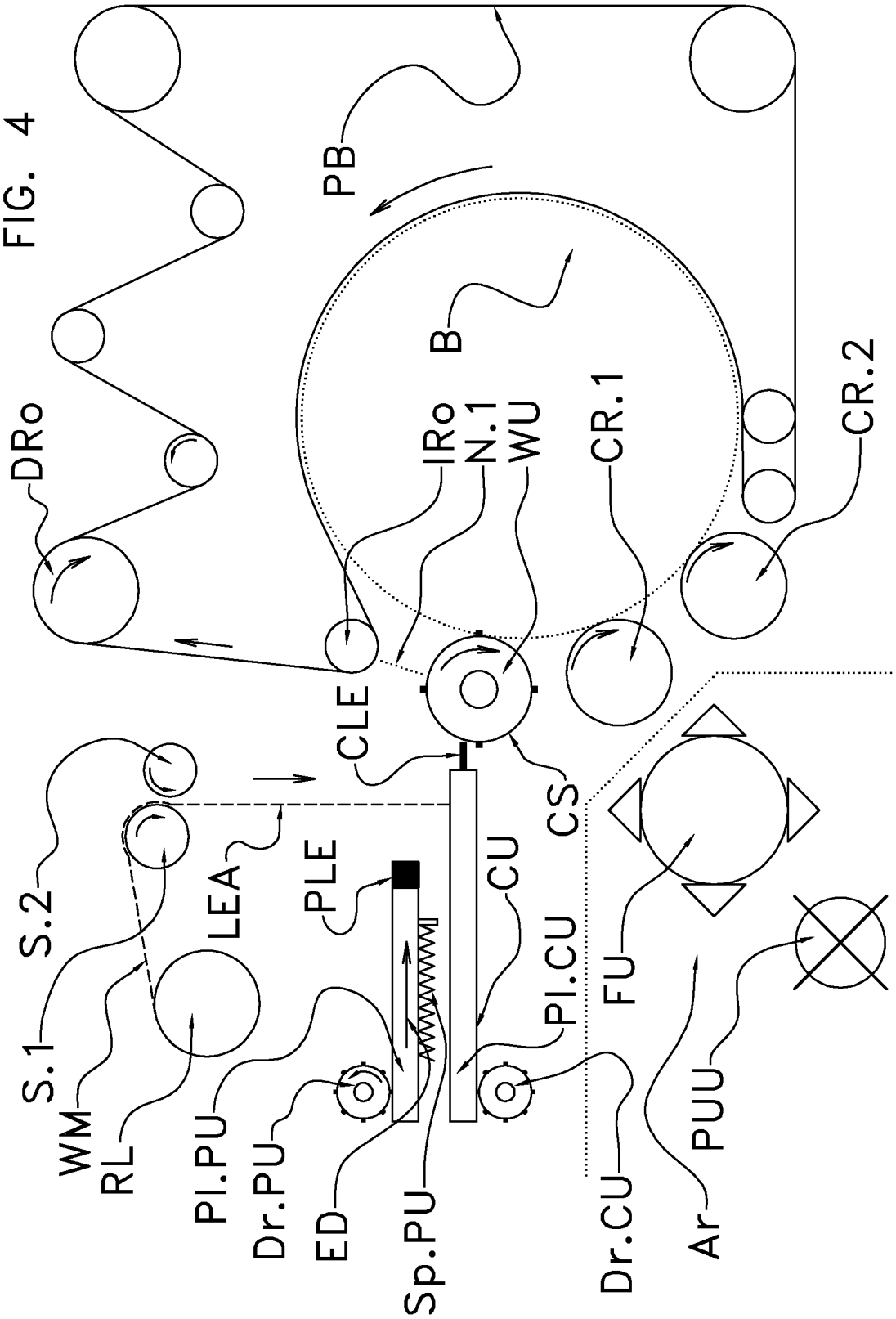
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FIG. 5

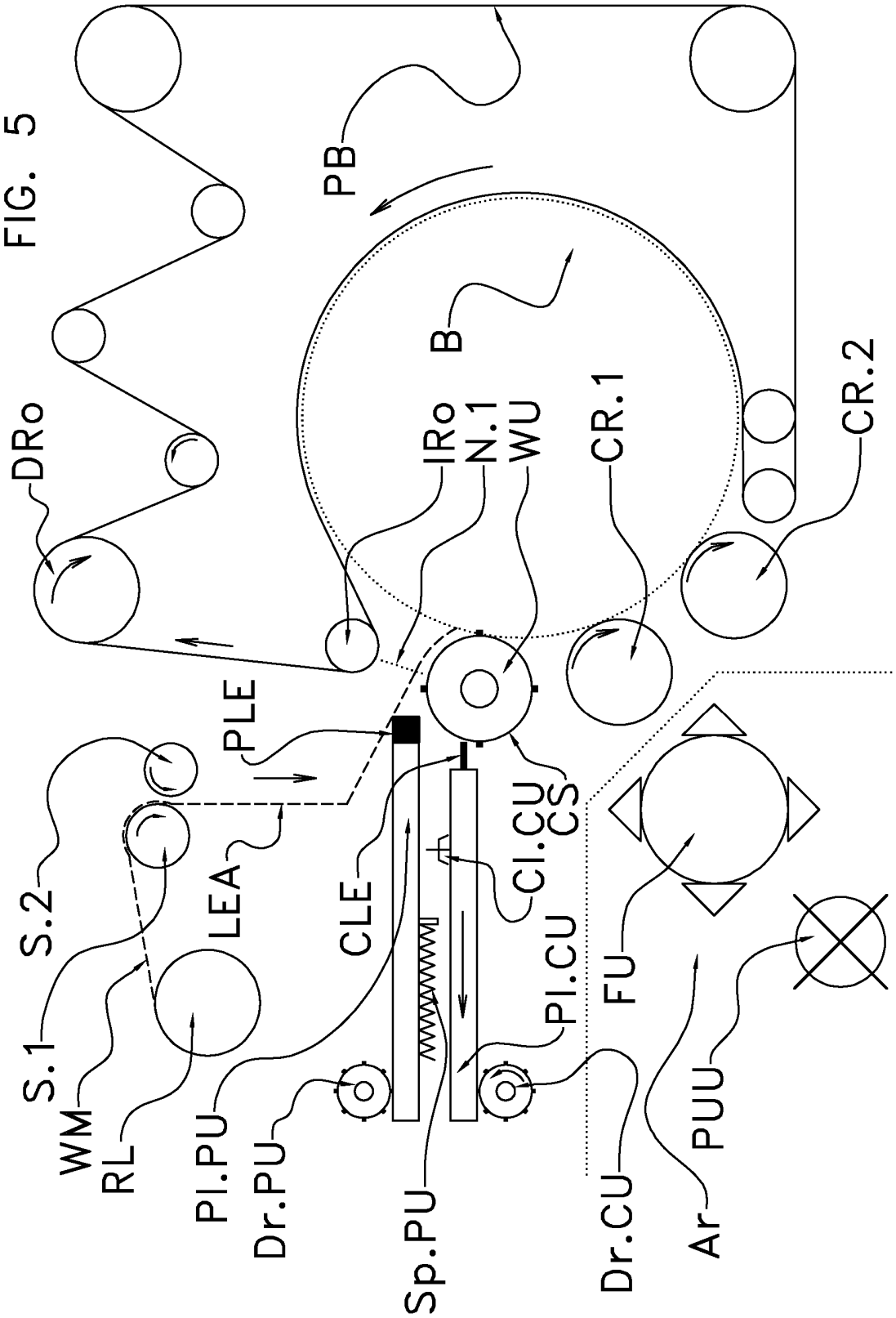
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FIG. 6

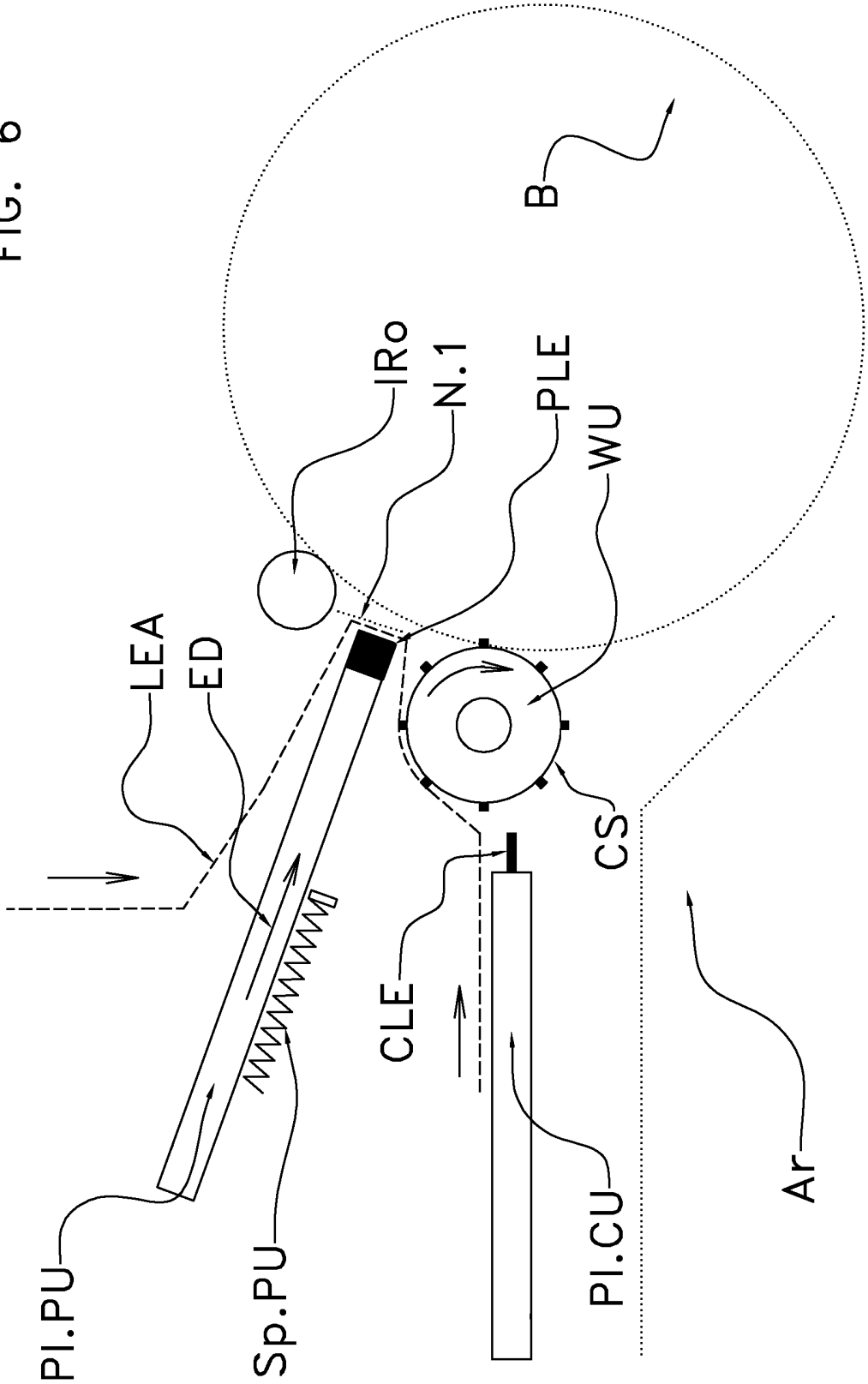
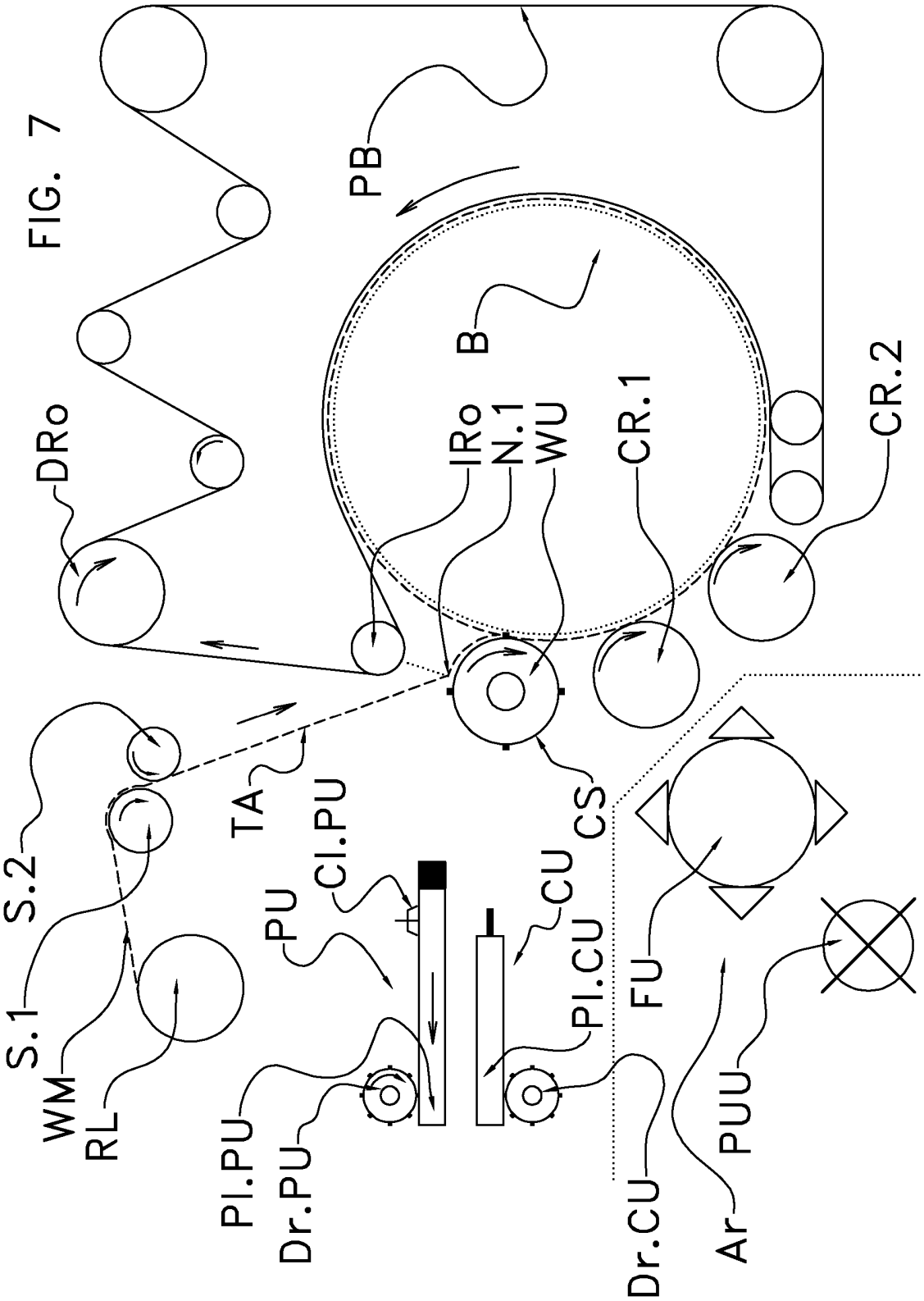


FIG. 7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SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	D4729/NLP
Nederlands aanvraag nr. **2010351**	Indieningsdatum **22-02-2013**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **Forage Innovations B.V.**	
Datum van het verzoek voor een onderzoek van internationaal type **22-06-2013**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN 60272**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

A01F15/07

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**A01F**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐ **GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐ **GEBREK AAN EENHEID VAN UITVINDING**	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2010351

A. CLASSIFICATIE VAN HET ONDERWERP
INV. A01F15/07
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)
A01F

Onderzochte andere documentatie dan de mimimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X,D	DE 10 2004 023701 A1 (KRONE BERNHARD GMBH MASCHF [DE]) 15 december 2005 (2005-12-15) in de aanvraag genoemd	1-6,8, 17-19,28
A	* alineas [0020], [0022], [0023], [0026] * * figuren 2-4 *	14

X,D	DE 36 17 155 A1 (ZWEEGERS & ZONEN P J [NL]) 26 november 1987 (1987-11-26) in de aanvraag genoemd * kolom 7, regel 5 - regel 14 * * kolom 8, regel 64 - kolom 9, regel 49 * * figuren 2-5 *	1,3,4,6, 17-19,28

A	US 5 129 207 A (BUTLER MARVIN W [US]) 14 juli 1992 (1992-07-14) * kolom 3, regel 21 - kolom 5, regel 9 * * figuur 2 *	1,17-19, 28

	-/--	

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
18 november 2013	
Naam en adres van de instantie	**De bevoegde ambtenaar**
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Baltanás y Jorge, R

1

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2010351

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	DE 195 39 297 C1 (DEERE & CO [US]) 10 april 1997 (1997-04-10) * kolom 5, regel 64 - kolom 6, regel 25 * * figuren 1, 2 * -----	7,16
A	FR 2 738 453 A1 (CLAAS OHG [DE]) 14 maart 1997 (1997-03-14) * bladzijde 4, regel 15 - bladzijde 5, regel 5 * * figuur 1 * -----	1,9-12, 14, 17-19, 23,25,28

Formulier PCT/ISA/201 (vervolg tweede blad) (Januari 2004)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2010351

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
DE 102004023701 A1	15-12-2005	GEEN	
DE 3617155 A1	26-11-1987	GEEN	
US 5129207 A	14-07-1992	AU 8718991 A	28-04-1992
		CA 2069616 A1	29-03-1992
		DE 69102990 D1	25-08-1994
		DE 69102990 T2	09-03-1995
		EP 0503046 A1	16-09-1992
		US RE35882 E	01-09-1998
		US 5129207 A	14-07-1992
		WO 9205685 A1	16-04-1992
DE 19539297 C1	10-04-1997	GEEN	
FR 2738453 A1	14-03-1997	DE 19530530 A1	20-02-1997
		FR 2738453 A1	14-03-1997

OCTROOICENTRUM NEDERLAND

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN60272	22.02.2013		NL2010351

International Patent Classification (IPC)
INV. A01F15/07

Applicant
Forage Innovations B.V.

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the application
- ☒ Box No. VIII Certain observations on the application

	Examiner
	Baltanás y Jorge, R

WRITTEN OPINION

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ on paper

   ☐ in electronic form

   c. time of filing/furnishing:

   ☐ contained in the application as filed.

   ☐ filed together with the application in electronic form.

   ☐ furnished subsequently for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	7, 9-16, 20-27, 29
	No:	Claims	1-6, 8, 17-19, 28
Inventive step	Yes:	Claims	7, 9-16, 20-27, 29
	No:	Claims	1-6, 8, 17-19, 28
Industrial applicability	Yes:	Claims	1-29
	No:	Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Box No. VII Certain defects in the application

see separate sheet

Box No. VIII Certain observations on the application

see separate sheet

Item V

Reference is made to the following documents:

D1 DE 10 2004 023701 A1 (KRONE BERNHARD GMBH MASCHF [DE]) 15 december 2005 (2005-12-15)in de aanvraag genoemd

D2 DE 36 17 155 A1 (ZWEEGERS & ZONEN P J [NL]) 26 november 1987 (1987-11-26)

D3 US 5 129 207 A (BUTLER MARVIN W [US]) 14 juli 1992 (1992-07-14)

D4 DE 195 39 297 C1 (DEERE & CO [US]) 10 april 1997 (1997-04-10)

D5 FR 2 738 453 A1 (CLAAS OHG [DE]) 14 maart 1997 (1997-03-14)

1 Document D1 discloses a feeding device comprising a material feeding unit (47-50) which provides wrapping material (see paragraph 22), a closing unit (38, 52) which can work in a closing position (see figures 2 and 3), a pushing unit (37) which can be displaced towards an inlet (5), wherein the feeding unit (47-50) supplies material such that the wrapping material form a hanging portion (see figure 4) in a position between the pushing unit (37) and the inlet (5), the closing unit (38, 52) being located under the pushing unit (37; see figure 2, and also figure 4 since the vertical position of the closing unit 38, 52 is anyway lower than that of the pushing unit 37) and closing a position outside the pressing chamber and below wrapping material feeding unit (47-50) avoiding that the wrapping material can enter into that space, the pushing unit (37) being adapted for pushing the hanging portion of the wrapping material towards the inlet (5).

Thus claim 1 is not acceptable for lack of novelty.

Furthermore, document D2 (closing unit 55, pushing unit 26, feeding unit 23-25; see figures 3 and 4) discloses as well the whole of the subject-matter of claim 1.

2 Dependent claims 2, 3, 4, 5, 6, 8, 17, 18, 19 and 28 seem to be disclosed in the above mentioned documents (for claim 2: see D1, plate 37; for claim 3: see D1, figure 2, or D2, figure 3; for claim 4: see D1, unit 11; for claim 5: see D1, figure 2; for claim 6: see D1 or D2; for claim 8: see D1, figure 2; for claims 17, 18, 19 and 28: see point 1 above).

Thus claims 2, 3, 4, 5, 6, 8, 17, 18, 19 and 28 are not acceptable for lack of novelty.

3 The subject-matter of claims 9-16, 20-27 and 29 seems to be neither disclosed nor rendered obvious by the considered prior art.

Item VII

1 Independent claims 1, 17, 18, 19 and 28 are not in the two-part form, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble and with the remaining features being included in the characterising part.

2 The numbers of some claims in the description (see page 5, line 15) and dependent claims (see claims 3, 7, 10 to 16, 18, and 20-29) has been omitted or indicated in a confusing way.

Item VIII

1 Claim 1 claims that "*de afsluiteenheid (CU) in de afsluitpositie ten minste gedeeltelijk een ruimte (Ar) buiten de kamer en naast en/of onder de wikkelmateriaaltoevoereenheid (WU) afsluit*", however no "*wikkelmateriaaltoevoereenheid (WU)*" is previously introduced in claim 1, which throws doubt about the meaning of such technical feature.

2 Claim 3 claims "*dat de plaat (Pl.PU) een bovenoppervlak heeft en de toevoerinrichting zodanig is ingericht dat het los doorhangende losse eindgedeelte (LEA) van het wikkelmateriaal (WM) op het bovenoppervlak van*

de plaat (Pl. PU) wordt geplaatst voordat het losse eindgedeelte (LEA) door de duweenheid (PU) wordt geduwd", however no disclosure can be found in the application about such an embodiment in which the hanging portion of wrapping material would be placed on the plate of the pushing unit.

As the only disclosed embodiment which could correspond to such features is the one wherein the hanging portion of wrapping material is located above the plate of the closing unit, it has been interpreted for the search and drafting of the present written opinion that a mistake occurred when drafting claim 3, and that the plate which is referred to in said claim belongs to the closing unit instead of the pushing unit.

3 Claim 11 claims that "*de afsluiteenheid (CU) naar de afsluitpositie gezwenkt kan worden door lineair bewogen te worden*", however it seems impossible to rotate an object by means of a linear movement, which results in a lack of clarity of the subject-matter of claim 11.

4 Claim 19 claims that "*het losse eindgedeelte (LEA) in een positie tussen de duweenheid (PU) en de inlaat (N.1) komt*", however no *duweeinheid* is previously defined in claim 19, which results in a lack of clarity of the subject-matter of said claim.

5 Claim 19 claims that "*de afsluiteenheid (CU) in de afsluitpositie ten minste gedeeltelijk een ruimte (Ar) een afsluiteenheid (CU) die onder duweenheid (PU) is aangebracht wordt tenminste tijdelijk in een sluitpositie afsluit die zich buiten de kamer en naast en/of onder de wikkelmateriaaltoevoereenheid (WU), bevindt*".

Said wording is confusing and throws doubt about the real scope of claim 19.

6 Claim 29 claims that "*de duweenheid (PU) en de afsluiteenheid (CU) zich beiden in de parkeerpositie bevinden*", however said *parkeerpositie* is not previously defined either in claim 28 or in claim 19, from which claim 29 depends, thus throwing doubt on the meaning of the above-mentioned feature.