

(19)



(11)

EP 4 516 709 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.03.2025 Bulletin 2025/10

(21) Application number: **23194157.6**

(22) Date of filing: **30.08.2023**

(51) International Patent Classification (IPC):
B65H 18/10 (2006.01) **B31B 70/94** (2017.01)
B65D 33/00 (2006.01) **B65H 18/28** (2006.01)
B65H 35/04 (2006.01)

(52) Cooperative Patent Classification (CPC):
B65H 18/10; B31B 70/942; B65H 18/28;
B65H 35/04; B65H 2301/5152; B65H 2701/191

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR

Designated Extension States:

BA

Designated Validation States:

KH MA MD TN

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(54) **A WINDING APPARATUS FOR PRODUCTION OF BOTTOM-FIRST BAG ROLLS**

(57) Disclosed herein is a winding apparatus for winding of bottom-first bag rolls, the winding apparatus comprising a perforator unit (105) and a winding shaft

(107). Further disclosed is a bottom-first bag roll making machine for making bottom-first bag rolls and a process for making bottom-first bag rolls.

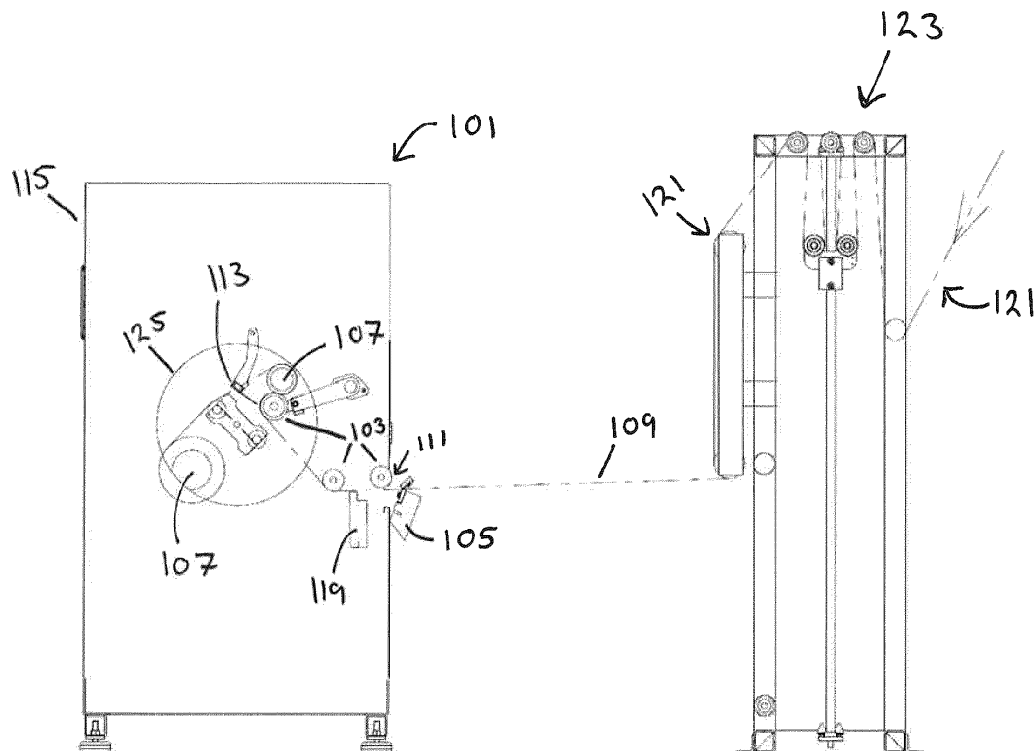


Figure 3

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Description

a perforator unit; and
a winding shaft;

Technical Field

[0001] The invention relates to a winding apparatus for winding of bottom-first bag rolls, the winding apparatus comprising a perforator unit and a winding shaft. The present invention further relates to a bottom-first bag roll making machine for making bottom-first bag rolls and a process for making bottom-first bag rolls.

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Background art

[0002] Premade bags are used in many industries, and especially in packaging. In many applications, in particular for automatic bag inserting and other packaging application, it is desirable to unwind the premade bags with the bottom first (seal off first (SOF)). This means that the opening of the premade bags comes out last and thus in the right position for automatic filling or inserting in a box e.g., a packaging box.

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[0003] In many manual processes there will also be big advantages to unwind the bag roll with the bottom first as this is the right position for filling without turning the premade bag upside down.

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[0004] However, the bag making industry has struggled with this for decades because unwinding with seal off first means, that the premade bags need to be wound with the open end (perforation) first and thus the front end of the bag in the machine direction. This has the disadvantage that air will enter into the bag and be trapped inside the bag before winding.

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[0005] However, multiple solutions have previously been proposed by the industry, such as e.g., running the whole process with extremely low speed to avoid air being trapped, or winding in a two-step process where winding in the production line will be done conventionally and in a later step rewound to finished bag rolls that can be unwound with the bottom first. Needless to say, this is very costly and with additional power consumption. Other alternative options previously proposed have been to punch a hole into the bottom of the bag so that the air can escape before winding, which will have the drawback, that the finished bag will leak, or to close the open end with static charging, which however makes it very difficult to open the bag in automatic packaging machines.

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[0006] It is thus an object of the present invention to propose a machine and a process able to produce bags which will be unwound with the bottom first, and which overcomes the disadvantages of the above solutions known in the art.

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Summary

[0007] Disclosed herein in a first aspect is a winding apparatus for production of bottom-first bag rolls, the winding apparatus comprising:

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wherein the winding apparatus is configured for receiving a web tubular film having crosswise welds with a predetermined distance between each crosswise weld hereby providing a section of web tubular film between each crosswise weld;

wherein the perforator unit is configured for providing a crosswise perforation in each section of the web tubular film such that a plurality of interconnected individual bags are created, wherein the plurality of interconnected individual bags are interconnected along transverse lines of weakness created by the crosswise perforations;

wherein the perforator unit is further configured such that the crosswise perforations are provided to the web tubular film having crosswise welds such that each of the plurality of interconnected individual bags are defined as a section between a downstream crosswise perforation and the next upstream crosswise perforation, wherein the downstream crosswise perforation defines a top and opening of each of the plurality of interconnected individual bags when the plurality of interconnected individual bags are individualized by breaking the transverse lines of weakness;

wherein the winding shaft is arranged to be rotated around its own axis and to receive the plurality of interconnected individual bags to be wound up; and

wherein the winding shaft is further arranged to wind up a predetermined length of the plurality of interconnected individual bags hereby creating the bottom-first bag roll.

[0008] By the above disclosed first aspect of the present invention, and the below disclosed aspects, it will be possible to wind the bag rolls with perforation first without air being trapped inside the bag, so that the bags can be unwound with bottom first without any of the drawbacks mentioned above. Hence, this invention will thus solve a challenge, which the industry has struggled with for decades.

[0009] In one or more embodiments, the winding apparatus further comprises at least one spindle, wherein the at least one spindle is configured for guiding the plurality of interconnected individual bags from the perforator unit to the winding shaft.

[0010] The perforator unit is set up to create crosswise perforations in the web tubular film, which preferably already has crosswise welds. This configuration allows for the formation of multiple interconnected individual bags. The crosswise perforations result in transverse lines of weakness that connect the individual bags to-

gether. The perforator unit is designed to create cross-wise perforations in the web tubular film, defining individual bags as sections between downstream and upstream crosswise perforations. The downstream perforation forms the top and opening of each individual bag, which can be separated by breaking the transverse line of weakness. In one or more embodiments, the downstream crosswise perforation defines a top and opening of the individual bag when the individual bag is individualized by breaking the transverse line of weakness; whereas the upstream crosswise weld together with the upstream crosswise perforation defines the bottom part of the individual bag when the individual bag is individualized by breaking the transverse line of weakness. In one or more embodiments, the web tubular film is a web tubular plastic film, such that the individual bags will be in the form of individual plastic bags.

[0011] A winding apparatus as disclosed herein is a unit for winding-up bags or strips/lines of interconnected individual bags that create bags when individualized, such as plastic bags to create bag rolls hereof. It is a mechanical device used in the packaging industry to efficiently roll and wind bags onto a roll, core, tube, or a spool for easy storage and dispensing. Alternatively, the winding apparatus may be configured such that a core or spool is not needed, but the interconnects individual bags are wound around itself to create the centre around which the remaining interconnects bags a wound. The first interconnected bag would in that case correspond to being a core for the other interconnected bags to wound around. This unit is commonly employed in factories or facilities that produce large quantities of bags, such as plastic bags, for various purposes, such as grocery bags, trash bags, or other disposable plastic bags.

[0012] A winding apparatus may typically comprise one or more of the following components:

- A winding shaft: This part holds the core or spool onto which the bags or interconnected bags will be wound or the winding shaft may create a centre at which these will be wound. The core is a cylindrical tube around which the bags or interconnected bags are wrapped during the winding process. It provides stability and support to the wound bags. The core or spool is herein disclosed as being a roll, core, tube, or spool onto which the bags are wound.
- A conveyor system: A conveyor system or feeding mechanism is used to transport the bags or line/strips of interconnected bags from the production line to the winding apparatus. This may ensure a continuous supply of bags for winding.
- A tension control mechanism: Used to ensure consistent winding and prevent overstretching or overlapping of the interconnected bags. It regulates the tension applied to the interconnected bags as they are wound onto the core.
- One or more spindles: The spindles incorporate one

or more rollers that rotate and guide the interconnected bags onto the core. These rollers help ensure smooth and even winding of the bags.

- A cutting mechanism/cutting arrangement: In some cases, the winding apparatus may include a cutting mechanism to trim the bags to a specific length before they are wound onto the core (if individual bags are wound onto the core) or to cut the plurality of interconnected individual bags after a predetermined length of the plurality of interconnected individual bags have been wound onto the core or around itself.
- A drive system: The drive system provides the necessary power to rotate the winding shaft and perform the winding process. It is motor-driven and can be controlled for speed and precision.

In a normal winding process, the process starts with the interconnected bags being fed into the winding apparatus through the conveyor system. The interconnected bags are then guided by the spindle(s) and wound onto the core in a tightly packed manner. As the core/roll fills up with wound interconnected bags, it can be replaced with an empty core/roll, and the winding process continues seamlessly. However, in the present process, as disclosed herein, the bags are not finalized when they are being fed into the winding apparatus through the conveyor system as they are at that point only made of a web tubular film having crosswise welds with a predetermined distance between each crosswise weld. The winding apparatus of the present invention further comprises a perforation unit, which when the web tubular film is fed to the unit makes a perforation in the tubular film, hereby completing the interconnected bag, such that individual bags can be created by breaking this transverse line of weakness. The tubular film, now being converted into interconnected bags, is then further conveyed to the winding shaft located close to the perforation unit, such that the interconnected bags are wound onto the core (or around itself) with the opening/top first, hereby creating a bag roll with minimum amount of air trapped into the interconnected bags and with bottom-first when unrolled from the core, i.e., hereby creating a seal off first (SOF) bag roll also called a bottom-first bag roll.

[0013] A winding apparatus streamlines the packaging process, making it more efficient and reducing the storage space required for bags or interconnected bags. It also facilitates easy dispensing, as the wound (interconnected) bags can be easily unrolled and separated from the bag roll as needed for use.

[0014] When manufacturing or winding bag rolls, there are two common methods: "bottom-first" and "top-first." In the "bottom-first roll" the film or material is initially fed onto the core from top to bottom. This means the outermost end of the bag roll will be the end of the interconnected bag that comprises the bottom of the last bag wound onto the core, i.e., the bottom weld of the bag. In the "top-first roll" the film is initially fed onto the core from

the bottom. This results in the opening of the last bag being the first the user meets when unrolling the bag roll, i.e., the top (broken) perforation of the bag making up the open end of the bag.

[0015] Some of the advantages of making a bottom-first bag roll is that it is the bottom of the bag that is unrolled first when the bags are pulled off the bag roll. This means that it can easily be stuffed into a cardboard box or a container, so the container is quickly ready for filling and packing. Further, in many manual processes there will also be big advantages to unwind the bag roll with the bottom first as this is the right position for filling without turning the individualised bag upside down.

[0016] There may be alternative ways of providing a bottom-first bag roll without the need of having the perforation unit close to the winding shaft. Such alternatives are e.g., to re-roll the bags after the winding so that they will turn "upside down" or the use of static electricity or vacuum to hold the bag opening closed, such that air is not pushed into the opening during the conveyor process from the perforation unit to the winding shaft. Alternatively, the whole process may be run at extremely low speed to avoid air being trapped, as the interconnected bags with perforations needs to travel further on the process line after the perforations are created.

[0017] In one or more embodiments, the bottom-first bag rolls are bottom-first plastic bag rolls.

[0018] A perforator unit as disclosed herein is a device or component used in various industries to create perforations or holes in materials, such as paper, cardboard, plastic, or metal. The process of creating these holes is called perforating, and the resulting pattern of holes is referred to as perforations. The perforator unit typically consists of a mechanism that houses the punch heads or pins and a means to control the spacing and pattern of the holes. The process of perforating may be manual or automated, depending on the application and the level of precision required.

[0019] A winding shaft as disclosed herein, also known as a winding mandrel or winding core, is a cylindrical device used in various industries for winding or coiling materials such as paper, film, fabric, plastic, wire, or other flexible materials into cores, tubes, rolls, or spools or around its own core. The winding shaft serves as the central support around which the material is wrapped during the winding process.

[0020] The winding shaft is an essential component in winding apparatuses, rewinders, slitters, and other equipment used in manufacturing, converting, and packaging processes. It provides stability and tension control during the winding operation, ensuring that the material is evenly wound and properly aligned on the core/roll/tube/spool or arounds its own core.

[0021] Some characteristics of a winding shafts may include:

- Core Diameter: The winding shaft has a specific diameter that determines the inner diameter of the

wound material roll. Different applications may require winding shafts with various core diameters to accommodate different roll sizes.

- Material: Winding shafts are commonly made of materials such as steel, aluminium, or other sturdy materials that can withstand the tension and stresses of the winding process.
- Surface Coating: Some winding shafts may have a specialized surface coating, such as rubber or silicone, to enhance grip and prevent slippage between the shaft and the material being wound.
- Expandable or Collapsible Shafts: Some winding shafts are designed to be expandable or collapsible, allowing easy loading and unloading of the wound material roll.
- Shaft Locking Mechanism: Winding shafts often have a locking mechanism that secures the wound material in place once the winding process is complete, preventing unwinding or unravelling.

[0022] A web tubular film having crosswise welds refers to a specific type of packaging film that is manufactured in a tubular form with crosswise welds or seals across the width of the film. This type of film is commonly used in the packaging industry for various applications, such as creating bags or pouches. The film may be produced in a continuous tube-like structure, with the edges sealed together to form a tube. It may alternatively be produced in other ways known in the art. At regular intervals along the width of the tubular film there are crosswise welds or seals. These seals create separate compartments/segments/sections in the film, allowing for easy separation and forming of individual bags when the film is cut or perforated. The web tubular film may be provided as a prefabricated web tubular film, where the term "prefabricated" indicates that the film is already manufactured and ready for use; however, the film may alternatively be created upstream of the winding apparatus in a continuous process. The film can be made from various materials, such as polyethylene (PE), polypropylene (PP), or other plastic resins, depending on the intended application and packaging requirements. In one or more embodiments, the film is made from polyethylene (PE).

[0023] In the context herein "downstream" and "upstream" refer to different stages or positions relative to the direction of flow of the process. These terms are used to describe the sequence or order of events in the process or the movement of materials in the system.

[0024] Downstream refers to the stages or processes that come after a particular point in a sequence or workflow. Upstream refers to the stages or processes that come before a particular point in a sequence or workflow. This means that downstream represents the stages or processes that come after a particular point in a sequence, while upstream represents the stages or processes that come before that point.

[0025] A crosswise weld as disclosed herein may also

be called a "crosswise seal" or "transverse seal/weld." A crosswise weld refers to a sealing line or weld that runs substantially crosswise/transversally to the direction of the material's flow. The crosswise weld may be formed in multiple different shapes, depending on the tool in the welding machine used to make the weld. In the context of packaging, it is a crucial component in creating individual bags or pouches from a continuous roll or web of flexible material, such as plastic film. During the packaging process, a crosswise seal is formed by applying heat or pressure to fuse the flexible material together. This creates a secure and air-tight seal, dividing the continuous material into separate compartments/sections. Each compartment becomes an individual bag or pouch, ready to be filled with the desired contents when an opening is created, such as via a cut or a perforation that is broken.

[0026] A crosswise perforation as used herein refers to a series of small holes or perforations made across the width of the material, perpendicular to the direction of its flow or movement. These perforations are created to allow for easy separation or tearing of the material along the perforation line. The crosswise perforation lines weaken the material along their path, enabling users or automated processes to tear or separate the material cleanly and efficiently.

[0027] When providing the crosswise perforation, the perforator unit is making individual bags interconnected along transverse lines of weakness, i.e., the crosswise perforations.

[0028] Disclosed herein in a second aspect is a bottom-first bag roll producing machine for producing bottom-first bag rolls, the machine comprising:

- a feed conveyor for advancing a length of a web tubular film having crosswise welds;
- a winding apparatus comprising:
 - a perforator unit; and
 - a winding shaft;

wherein the winding apparatus is configured for receiving a web tubular film having crosswise welds with a predetermined distance between each crosswise weld hereby providing a section of web tubular film between each crosswise weld;

wherein the perforator unit is configured for providing a crosswise perforation in each section of the web tubular film such that a plurality of interconnected individual bags are created, wherein the plurality of interconnected individual bags are interconnected along transverse lines of weakness created by the crosswise perforations;

wherein the perforator unit is further configured such that the crosswise perforations are provided to the web tubular film having crosswise welds such that each of the plurality of interconnected individual bags are defined as a section between a downstream crosswise perforation and the next upstream

crosswise perforation, wherein the downstream crosswise perforation defines a top and opening of each of the plurality of interconnected individual bags when the plurality of interconnected individual bags are individualized by breaking the transverse lines of weakness;

wherein the winding shaft is arranged to be rotated around its own axis and to receive the plurality of interconnected individual bags to be wound up; and wherein the winding shaft is further arranged to wind up a predetermined length of the plurality of interconnected individual bags hereby creating the bottom-first bag roll.

[0029] Disclosed herein in a third aspect is a process for producing bottom-first bag rolls, the process comprises the following steps:

- advancing a length of a web tubular film having crosswise welds through a feed conveyor to a winding apparatus;
- crosswise perforating the web tubular film at a predetermined distance upstream of each crosswise weld at a perforator unit located in the winding apparatus, to create a transverse line of weakness in the web tubular film material having crosswise welds hereby creating a plurality of interconnected individual bags defined as sections between a downstream crosswise perforation and the next upstream crosswise perforation, wherein the downstream crosswise perforation defines a top and opening of each of the plurality of interconnected individual bags when the plurality of interconnected individual bags are individualized by breaking the transverse lines of weakness;
- guiding the plurality of interconnected individual bags from the perforator unit to a winding shaft arranged to be rotated around its own axis;
- winding up the plurality of interconnected individual bags hereby producing a bottom-first bag roll.

[0030] In one or more embodiments, the plurality of interconnected individual bags are guided by the at least one spindle from the perforator unit to a winding shaft arranged to be rotated around its own axis.

Brief description of the drawings

[0031]

Figure 1 shows a winding apparatus.

Figure 2 shows a winding apparatus comprising a hot melt unit.

Figure 3 shows a winding apparatus together with the dancer unit.

Detailed description

[0032] The description herein of any aspect or embodiment of the invention using terms such as "comprising", "having", "including", or "containing" with reference to an element or elements is intended to provide support for a similar aspect or embodiment of the invention that "consists of", "consists essentially of", or "substantially comprises" that particular element or elements, unless otherwise stated or clearly contradicted by context, e.g. a composition described herein as comprising a particular element should be understood as also describing a composition consisting of that element, unless otherwise stated or clearly contradicted by context. It will be further understood that the terms "comprises", "comprising", "includes" and/or "including," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0033] As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms, including "at least one," unless the content clearly indicates otherwise. "At least one" is not to be construed as limiting "a" or "an."

[0034] Unless otherwise defined, all terms used herein (including technical and scientific terms) have the same meaning as commonly understood by those skilled in the art to which this invention pertains. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined in the present specification.

[0035] The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

[0036] Effects and features of the second and third aspects are to a large extent analogous to those described above in connection with the first aspect. Embodiments mentioned in relation to the first aspect are largely compatible with the second and/or third aspects.

[0037] The present disclosure will become apparent from the detailed description given below. The detailed description and specific examples disclose preferred embodiments of the disclosure by way of illustration only. Those skilled in the art understand from guidance in the detailed description that changes and modifications may be made within the scope of the disclosure.

[0038] In one or more embodiments, the winding apparatus further comprises an inlet section, wherein the perforator unit is located at the inlet section. An inlet section as disclosed herein refers to the initial part of

the winding apparatus, within the working space of the winding apparatus, i.e., and inlet as being part of the winding apparatus and not further upstream of the processing line.

[0039] In one or more embodiments, the perforator unit is configured to provide each crosswise perforation at a predetermined distance upstream from each crosswise weld. In one or more embodiments, the perforator unit is configured such that each crosswise perforation is made adjacent to each crosswise weld. Adjacent as used herein is when the perforation and the weld are almost directly next to each other or located side by side without considerable space in between. By considerable space is meant that the distance between the perforation and the weld is a factor of 10 smaller than the distance between two crosswise perforations or two crosswise welds. In one or more embodiments, the predetermined distance upstream from each crosswise weld is between 1 and 50 mm, such as between 1 and 40 mm, such as between 1 and 30 mm, such as between 1 and 25 mm, such as between 2 and 20 mm, or such as between 3 and 15 mm.

[0040] In one or more embodiments, the perforator unit is configured such that each crosswise perforation is made within a range of 1 mm to 100 mm from the adjacent downstream crosswise weld. In one or more embodiments, the perforator unit is configured to provide a crosswise perforation between a downstream weld and an upstream weld, and closer to the downstream weld compared to the upstream weld.

[0041] In one or more embodiments, the perforator unit is configured to provide the crosswise perforations no more than 10% downstream of the crosswise welds compared to a total length of the individual bag from top to bottom. The total length of the individual bag from top to bottom is measured by separating/individualizing a bag from the web tubular film having both crosswise welds and crosswise perforations and measuring the length from top to bottom, i.e., the total length of the bag.

[0042] In one or more embodiments, the perforator unit is configured to provide the crosswise perforations at a predetermined distance upstream from each crosswise weld.

[0043] In one or more embodiments, the winding apparatus further comprises a breaker bar arrangement, wherein the breaker bar arrangement is arranged for cutting (breaking) the plurality of interconnected individual bags after the predetermined length of the plurality of interconnected individual bags have been wound up by the winding shaft.

[0044] In one or more embodiments, the distance from the perforator unit to the winding shaft is maximum 150 cm, such as maximum 100 cm, such as maximum 75 cm, such as maximum 50 cm, such as maximum 40, such as maximum 30 cm. The distance between the perforator unit and the winding shaft is defined as the distance the plurality of interconnected individual bags needs to travel after having received the perforations to meeting the winding shaft. The distance may be measured by placing

the measuring tool against the centre of the perforation unit as the starting point and measure to the centre of the winding shaft as the endpoint.

[0045] It is an advantage that the perforation is performed close to the winding shaft, as this will prevent or reduce air from entering the bags, as the bags are rolled into a bottom-first bag roll. Air entering into the bags will not be pushed out of the bag in a process of making a bottom-first bag roll, and therefore air trapped in the bags will increase the diameter of a bag roll with the same number of bags rolled onto it.

[0046] In one or more embodiments, the distance from the perforator unit to the winding shaft is between 100 cm and 10 cm, such as between 20 cm and 90 cm, such as between 30 cm and 80 cm, or such as between 40 cm and 70 cm.

[0047] In one or more embodiments, the winding apparatus further comprises a housing enclosing a workspace of the winding apparatus, wherein the workspace comprises at least the perforator unit and the winding shaft. The workspace may further comprise the at least one spindle.

[0048] In one or more embodiments, the winding apparatus further comprises a hot melt unit configured for applying a hot melt to a bottom side of the plurality of interconnected individual bags, wherein the bottom side of the plurality of interconnected individual bags is the side closest to the core after being wound up by the winding shaft onto the core, and wherein the hot melt unit is located after the perforator unit but before the winding shaft. In one or more embodiments, the hot melt unit is located downstream the perforator unit but upstream the winding shaft.

[0049] A hot melt may hereby be applied from the bottom side just before winding the plurality of interconnected individual bags onto a new core. The first contact point of the plurality of interconnected individual bags after being applied with hot melt is the core/roll. The timing for the contact between core and hot melt may be synchronized with a breaker bar in order to prevent unforeseen wrap around at the core. In the case that the plurality of interconnected individual bags does not need to be fixed to the core, the breaker bar can make a conventional roll change that wraps the film around the core.

[0050] The first interconnected bag is hereby glued to the core, or alternatively to "itself". This step is today often done with double-adhesive tape. The cores however can be recycled if the hot melt is not on the core itself. The innermost bag of the interconnected bags glued to itself would go to waste anyway in the traditional method. Therefore, by gluing the first bag to "itself", the core may be recycled, as it would not comprise any residual glue once the first bag is removed. If the first interconnected bag is glued to the core, the step of adding double adhesive tape to the core is omitted.

[0051] A hot melt refers to a type of thermoplastic adhesive that is solid at room temperature but becomes

liquid and adhesive when heated. It is commonly used in various industrial and commercial applications due to its quick-setting properties and strong bonding capabilities. The hot melt adhesive is typically supplied in the form of solid pellets, sticks, or blocks, which are loaded into a hot melt glue gun or hot melt applicator. The glue gun or applicator heats the adhesive, melting it into a liquid state, which can then be applied to the desired surface, in this case the bottom side of the film.

[0052] A core as used herein may also be called a roll, tube, or a spool. The core is preferably a roll that is cylindrical. In one or more embodiments, the core may be a paper roll or a cardboard roll. In one or more embodiments the core has a diameter of 10 mm to 1000 mm, such as 20 mm to 800 mm, or such as 20 mm to 600 mm.

[0053] The predetermined length of the web tubular film to be wound onto the core may further correspond to a predetermined amount/number of individual bags, based on the length of each bag. Hence, in one or more embodiments, the winding shaft is arranged to wind up a predetermined number of individual bags.

[0054] In one or more embodiments, the winding apparatus further comprises a base frame.

[0055] In one or more embodiments, the winding apparatus further comprises a feeding mechanism for supplying a continuous stream of web tubular film having crosswise welds to the perforator unit and the winding shaft.

[0056] In one or more embodiments, the winding apparatus further comprises a tension control mechanism to regulate the tension of the film during winding.

[0057] In one or more embodiments, the winding apparatus further comprises a control unit operatively connected to the feeding mechanism, tension control mechanism, and/or cutting arrangement, wherein the control unit is configured to automate and control the winding process.

[0058] In one or more embodiments, the winding apparatus further comprises an unload position arranged for receiving the bottom-first bag roll.

[0059] In one or more embodiments, the unload position comprises a label system arranged for close fix a roll tail of the bottom-first bag roll with a label, so that the bottom-first bag roll is prepared for automatic packaging.

[0060] In the unload position a label system may be used to close fix the roll tail, so that the finished bag roll is prepared for automatic packaging. The finished bag roll may automatically slide off the winding shaft and can be placed in a position that enable a robot to pick up the bag roll.

[0061] In one or more embodiments, the winding apparatus further comprises an additional winding shaft. In one or more embodiments the winding apparatus comprises four winding shafts in total. By having more winding shafts the winding apparatus may be configured to run two streams of web tubular film and to have further winding shafts on one stream, the apparatus may be config-

ured for a timeless shift between one core and the next core by shifting the film to wind on the second winding shaft in said stream.

[0062] In one or more embodiments, a core is positioned on the winding shaft to receive the plurality of interconnected individual bags to be wound up.

[0063] In one or more embodiment, the core is made of a plastic material or a paper material, such as cardboard.

[0064] In one or more embodiments, the feed conveyor comprises a dancer unit. A dancer unit is used to maintain tension in the moving web tubular film as it is being wound onto the winding shaft. It helps to prevent wrinkles, stretching, and other issues that can arise due to uneven tension.

[0065] In one or more embodiments, the bottom-first bag roll producing machine further comprises a hot melt system, a welding machine, an edge guide, a punch unit, an extractor, a gusseting station, a folding unit, a reinforcement strip applicator, and/or an unwinder.

[0066] In one or more embodiments, the process further comprising the step of cutting the plurality of interconnected individual bags after a predetermined length of the plurality of interconnected individual bags have been wound up by the winding shaft.

[0067] In one or more embodiments, the process further comprises a step of close fix a roll tail of the bottom-first bag roll with a label, so that the finished bottom-first bag roll is prepared for automatic packaging.

[0068] In one or more embodiments, a core is positioned onto the winding shaft whereby the plurality of interconnected individual bags are wound up onto the core hereby producing the bottom-first bag roll.

[0069] In one or more embodiments, the process further comprises a step of applying a hot melt to the bottom side of the plurality of interconnected individual bags, wherein the bottom side of the plurality of interconnected individual bags is the side closest to the core after being wound up by the winding shaft onto the core.

[0070] In one or more embodiments, the process further comprises one or more of the steps of:

- unwinding a web tubular film on an unwinder;
- gusseting and/or folding the web tubular film on a gusseting station and/or a folding unit;
- printing on the web tubular film;
- welding the web tubular film on a welding machine to create crosswise welds with a predetermined distance between each crosswise weld in the web tubular film.

[0071] When describing the embodiments, the combinations and permutations of all possible embodiments have not been explicitly described. Nevertheless, the mere fact that certain measures are recited in mutually different dependent claims or described in different embodiments does not indicate that a combination of these measures cannot be used to advantage. The present

invention envisages all possible combinations and permutations of the described embodiments.

Detailed description of the drawings

[0072] Various examples are described hereinafter with reference to the figures. It should also be noted that the figures are only intended to facilitate the description of the examples. They are not intended as an exhaustive description of the claimed invention or as a limitation on the scope of the claimed invention. In addition, an illustrated example needs not have all the aspects or advantages shown. An aspect or an advantage described in conjunction with a particular example is not necessarily limited to that example and can be practiced in any other examples even if not so illustrated, or if not so explicitly described.

[0073] As can be seen in the figures, a web tubular film having crosswise welds 109 enters into the winding apparatus 101 via a feed conveyer 121. This feed conveyer may comprise a dancer unit 123 e.g., an in-line dancer, which can control the tension of the web tubular film and further is able to act as an accumulator to take up length variations of the web tubular film between the dancer and winding apparatus. In one embodiment, in the frame for the dancer 123 is normally included an edge guide in order to align the web tubular film so that the edge is straight before entering the winding apparatus.

[0074] A housing 115 enclosing a workspace of the winding apparatus 101, wherein the workspace comprises at least the perforator unit 105, the at least one spindle 103, and the winding shaft 107 may be present.

[0075] A sensor (not shown) may detect the crosswise welds in the web tubular film. The crosswise welds may be made to the web tubular film in a welding machine before the web tubular film enters the winding apparatus 101 or the dancer 123. The signal from the sensor activates the perforator unit 105, so that a crosswise perforation is made in each section of the web tubular film such that a plurality of interconnected individual bags is created, wherein the plurality of interconnected individual bags are interconnected along transverse lines of weakness created by the crosswise perforations/perforation.

[0076] The crosswise perforations are provided to the web tubular film having crosswise welds 109 such that each of the plurality of interconnected individual bags are defined as a section between a downstream crosswise perforation and the next upstream crosswise perforation, wherein the downstream crosswise perforation defines a top and opening of each of the plurality of interconnected individual bags when the plurality of interconnected individual bags are individualized by breaking the transverse lines of weakness. Hence, the opening of the next bag is in the front end of the bag.

[0077] The perforator unit 105 may be located at the inlet section 111 of the winding apparatus 101, which means a very short distance to the winding point. Due to the short distance between the perforator unit 105 and to

the winding point (the winding shaft 107) it can be avoided or minimized that air enters and being trapped in the bag.

[0078] Optionally a hot melt unit 119 configured for applying a hot melt to a bottom side of the plurality of interconnected individual bags is added to the winding unit 101. The hot melt unit is located after the perforator unit 105 but before the winding shaft 107.

[0079] Hence, a hot melt may be applied from the bottom side just before winding the film and the first contact point of the web tubular film after being applied with hot melt may in one embodiment be a core e.g., a paper or plastic core/roll. The timing for the contact between core and hot melt may be synchronized with a breaker bar 113 in order to prevent unforeseen wrap around at the core.

[0080] In one embodiment, the hot melt can be added at a longer distance from the perforation. In this way the hot melt will be added between first layer of the web tubular film and the second layer of the web tubular film. This makes it possible to fix the web tubular film to the core without contaminating the core, which means that the core can be reused when the finished bag roll is unwinded.

[0081] In the figures are also shown a breaker bar 113 (may be called a cutter arrangement if perforations are not present), arranged for cutting the plurality of interconnected individual bags after the predetermined length of the plurality of interconnected individual bags have been wound up by the winding shaft 107.

[0082] When the bottom-first bag roll is finished, it will change to the unload position and a new core will be ready for a new roll start. A turret 125 of the winding apparatus 101 may move the bottom-first bag rolls (the finished roll) to the unload position (not shown in the figures) arranged for receiving the bottom-first bag roll (may also be called the exit position) and make a roll change. The roll change may happen by the turret 125 delivering the bottom-first bag rolls to the unload position e.g., a tray and where the bottom-first bag rolls afterwards is moved sideways out of the unload position. The finished roll may automatically slide off the winding shaft. Grippers may then apply a new roll/core from a magazine to the winding shaft 107.

[0083] In the unload position, a label system (not shown) may be used to close fix the roll tail, so that the finished bag roll is prepared for automatic packaging.

References

[0084]

- 101 winding apparatus
- 103 spindle
- 105 perforator unit
- 107 winding shaft
- 109 web tubular film having crosswise welds
- 111 inlet section
- 113 breaker bar

- 115 housing
- 119 hot melt unit
- 121 feed conveyor
- 123 dancer unit
- 125 turret

Claims

1. A winding apparatus for production of bottom-first bag rolls, the winding apparatus comprising:

- a perforator unit; and
- a winding shaft;

wherein the winding apparatus is configured for receiving a web tubular film having crosswise welds with a predetermined distance between each crosswise weld hereby providing a section of web tubular film between each crosswise weld;

wherein the perforator unit is configured for providing a crosswise perforation in each section of the web tubular film such that a plurality of interconnected individual bags are created, wherein the plurality of interconnected individual bags are interconnected along transverse lines of weakness created by the crosswise perforations;

wherein the perforator unit is further configured such that the crosswise perforations are provided to the web tubular film having crosswise welds such that each of the plurality of interconnected individual bags are defined as a section between a downstream crosswise perforation and the next upstream crosswise perforation, wherein the downstream crosswise perforation defines a top and opening of each of the plurality of interconnected individual bags when the plurality of interconnected individual bags are individualized by breaking the transverse lines of weakness;

wherein the winding shaft is arranged to be rotated around its own axis and to receive the plurality of interconnected individual bags to be wound up; and

wherein the winding shaft is further arranged to wind up a predetermined length of the plurality of interconnected individual bags hereby creating the bottom-first bag roll.

2. The winding apparatus according to claim 1, wherein the winding apparatus further comprises an inlet section, and wherein the perforator unit is located at the inlet section.

3. The winding apparatus according to any of the preceding claims, wherein the perforator unit is configured to provide each crosswise perforation at a pre-

determined distance upstream from each crosswise weld.

4. The winding apparatus according to any of the preceding claims, wherein the perforator unit is configured such that each crosswise perforation is made within a range of 1 mm to 100 mm from the adjacent downstream crosswise weld. 5
5. The winding apparatus according to any of the preceding claims, wherein the winding apparatus further comprises a breaker bar arrangement, wherein the breaker bar arrangement is arranged for cutting the plurality of interconnected individual bags after the predetermined length of the plurality of interconnected individual bags have been wound up by the winding shaft. 10 15
6. The winding apparatus according to any of the preceding claims, wherein the distance from the perforator unit to the winding shaft is maximum 150 cm, such as maximum 100 cm, such as maximum 75 cm, such as maximum 50 cm, such as maximum 40, such as maximum 30 cm. 20 25
7. The winding apparatus according to any of the preceding claims, wherein the winding apparatus further comprises an unload position arranged for receiving the bottom-first bag roll. 30
8. The winding apparatus according to claim 7, wherein the unload position comprises a label system arranged for close fix a roll tail of the bottom-first bag roll with a label, so that the bottom-first bag roll is prepared for automatic packaging. 35
9. The winding apparatus according to any of the preceding claims, wherein a core is positioned on the winding shaft to receive the plurality of interconnected individual bags to be wound up. 40
10. The winding apparatus according to any of the preceding claims, wherein the winding apparatus further comprises a hot melt unit configured for applying a hot melt to a bottom side of the plurality of interconnected individual bags, wherein the bottom side of the plurality of interconnected individual bags is the side closest to the core after being wound up by the winding shaft onto the core, and wherein the hot melt unit is located after the perforator unit but before the winding shaft. 45 50
11. A bottom-first bag roll producing machine for producing bottom-first bag rolls, the machine comprising: 55
 - a feed conveyor for advancing a length of a web tubular film having crosswise welds;
 - a winding apparatus comprising:

- a perforator unit; and
- a winding shaft;

wherein the winding apparatus is configured for receiving a web tubular film having crosswise welds with a predetermined distance between each crosswise weld hereby providing a section of web tubular film between each crosswise weld;

wherein the perforator unit is configured for providing a crosswise perforation in each section of the web tubular film such that a plurality of interconnected individual bags are created, wherein the plurality of interconnected individual bags are interconnected along transverse lines of weakness created by the crosswise perforations;

wherein the perforator unit is further configured such that the crosswise perforations are provided to the web tubular film having crosswise welds such that each of the plurality of interconnected individual bags are defined as a section between a downstream crosswise perforation and the next upstream crosswise perforation, wherein the downstream crosswise perforation defines a top and opening of each of the plurality of interconnected individual bags when the plurality of interconnected individual bags are individualized by breaking the transverse lines of weakness;

wherein the winding shaft is arranged to be rotated around its own axis and to receive the plurality of interconnected individual bags to be wound up; and

wherein the winding shaft is further arranged to wind up a predetermined length of the plurality of interconnected individual bags hereby creating the bottom-first bag roll.

12. The bottom-first bag roll producing machine according to claim 11, wherein the feed conveyor comprises a dancer unit. 40

13. A process for producing bottom-first bag rolls, the process comprises the following steps: 45

- advancing a length of a web tubular film having crosswise welds through a feed conveyor to a winding apparatus;

- crosswise perforating the web tubular film at a predetermined distance upstream of each crosswise weld at a perforator unit located in the winding apparatus, to create a transverse line of weakness in the web tubular film material having crosswise welds hereby creating a plurality of interconnected individual bags defined as sections between a downstream crosswise perforation and the next upstream crosswise

perforation, wherein the downstream crosswise perforation defines a top and opening of each of the plurality of interconnected individual bags when the plurality of interconnected individual bags are individualized by breaking the transverse lines of weakness; 5

- guiding the plurality of interconnected individual bags from the perforator unit to a winding shaft arranged to be rotated around its own axis; 10
- winding up the plurality of interconnected individual bags hereby producing a bottom-first bag roll.

14. The process for producing bottom-first bag rolls according to claim 13, the process further comprising the step of cutting the plurality of interconnected individual bags after a predetermined length of the plurality of interconnected individual bags have been wound up by the winding shaft. 15

15. The process for producing bottom-first bag rolls according to any one of claims 13-14, wherein the process further comprises a step of applying a hot melt to the bottom side of the plurality of interconnected individual bags, wherein the bottom side of the plurality of interconnected individual bags is the side closest to the core after being wound up by the winding shaft onto the core. 20 25

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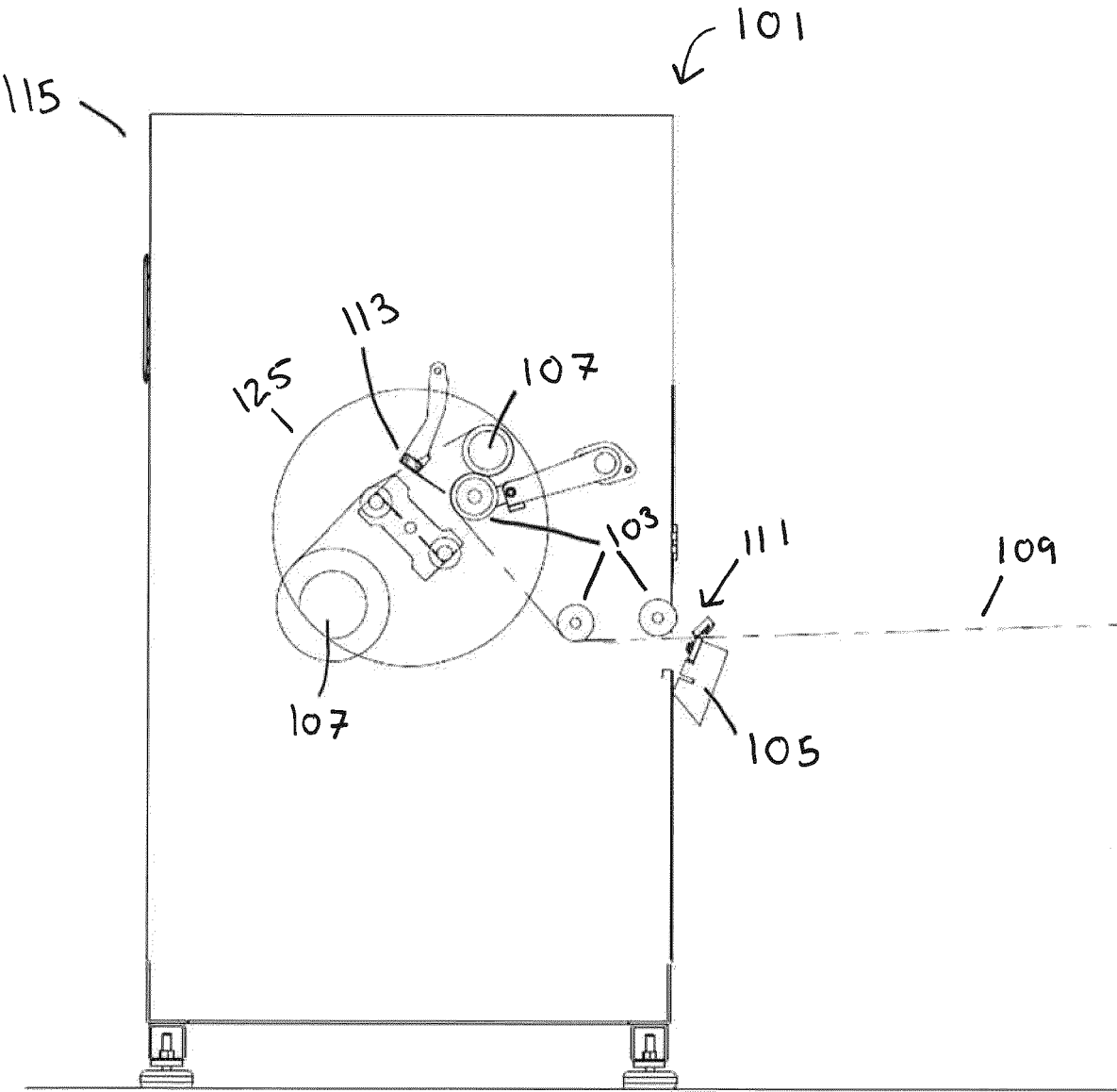


Figure 1

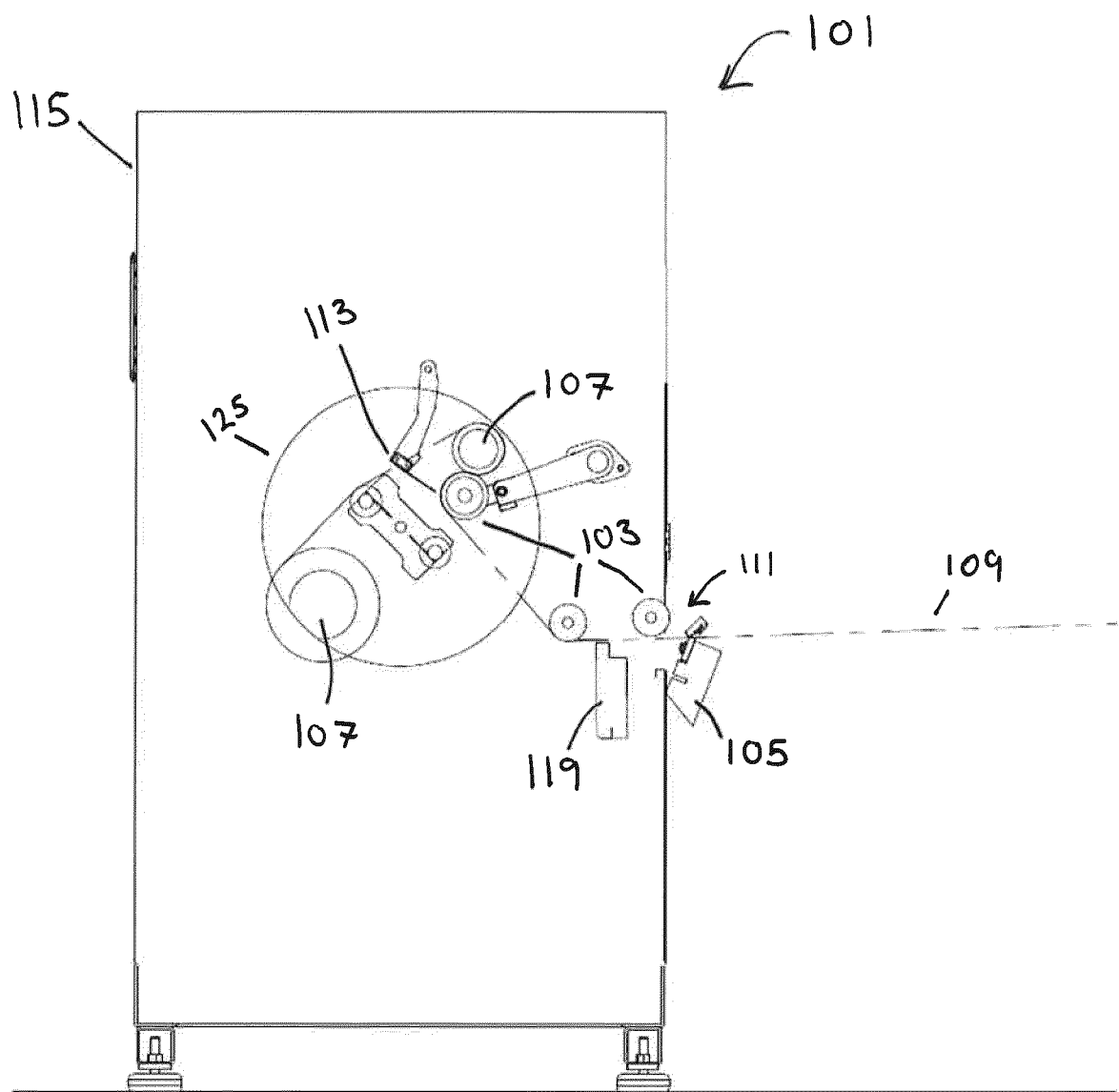


Figure 2

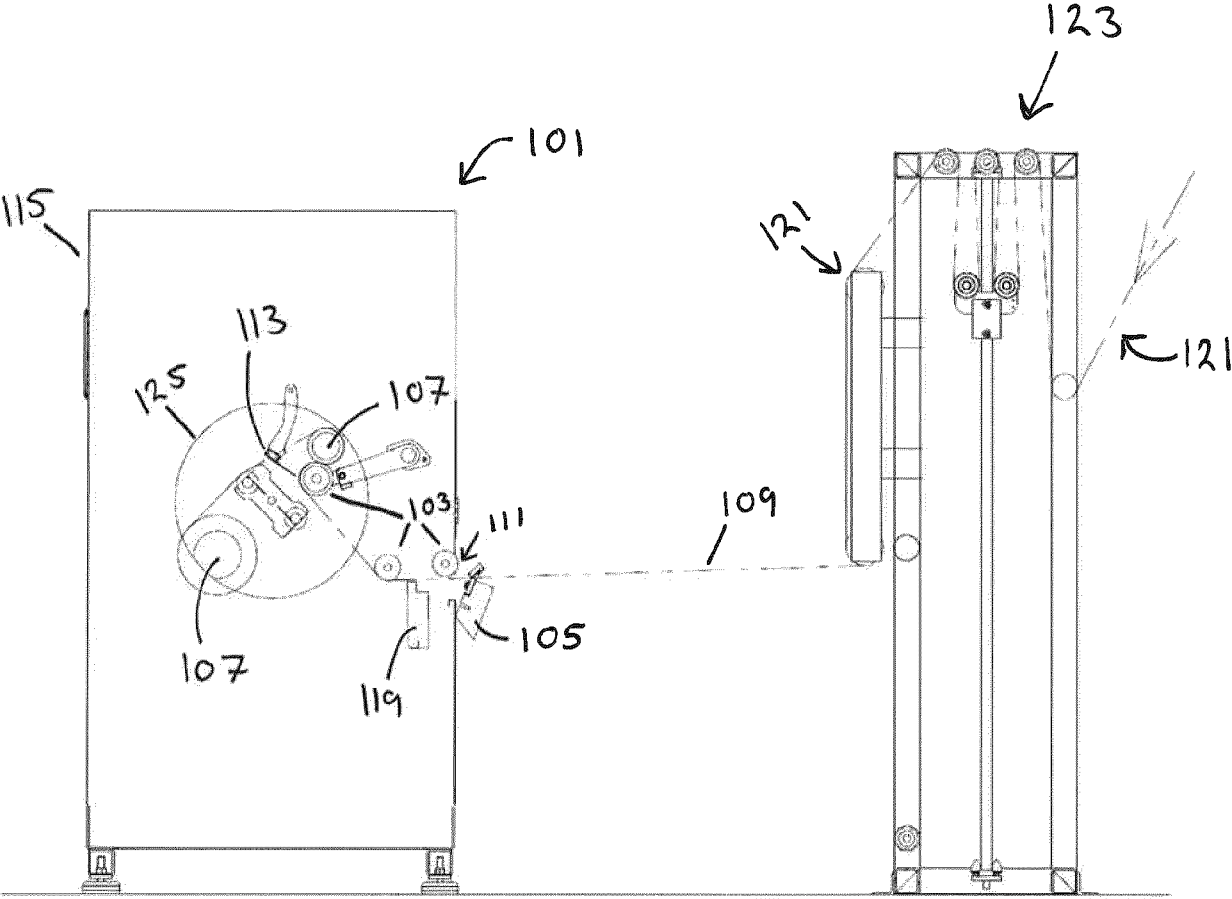


Figure 3



EUROPEAN SEARCH REPORT

Application Number

EP 23 19 4157

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2005/259892 A1 (TAN GREGORIO L [US]) 24 November 2005 (2005-11-24) * abstract * * figures 1-3 * * paragraphs [0039], [0048] * * the whole document * -----	1-15	INV. B65H18/10 B31B70/94 B65D33/00 B65H18/28 B65H35/04
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H B65D B31F B31B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		24 February 2024	Piekarski, Adam
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24-02-2024

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