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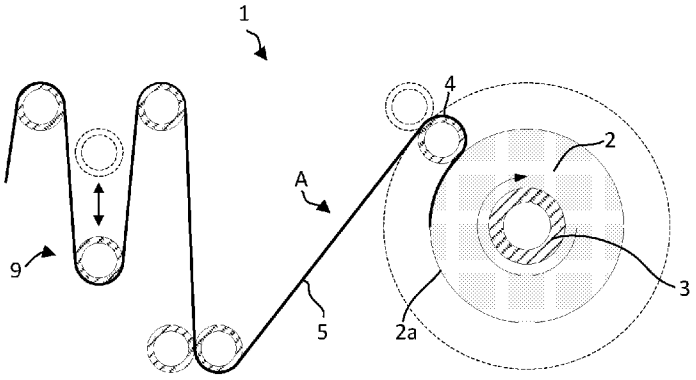

Fig. 2

(57) Abstract: Apparatus for unwinding a portion of a packaging film from a reel comprising a support roller and a first roller. The support roller is configured to engage a reel and rotate the reel around an unwinding axis. The first roller extends along and is rotatable around a first axis of rotation. The first roller is configured to contact an external surface of the reel. The first roller is further configured to unwind the film portion and feed the unwound film portion along an unwinding path. The first roller is movable between a plurality of positions to maintain contact between the first roller and the external surface of the reel as the reel is unwound.

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TITLE: "Apparatus and method for unwinding a film portion"

DESCRIPTION

FIELD OF THE INVENTION

The present disclosure is in the technical field of apparatuses and methods for unwinding a portion of a packaging film from a reel. In particular, the apparatus of the present disclosure may be coupled to a packaging machine for feeding a packaging film and the methods may be part of a packaging process.

BACKGROUND ART

Apparatuses for unwinding a film portion from a reel of film material are known in the art. An apparatus of the prior art comprises a support roller which engages the reel of film material. The support roller extends along an unwinding axis, and it is configured to rotate the reel around the unwinding axis for unwinding it.

This known apparatus further comprises a tensioning device coupled to the support roller. The tensioning device receives an unwound film portion from the reel. In detail, the unwound film portion moves from the reel at the support roller to the tensioning device following an unwinding path. The tensioning device is configured to apply a tensioning force to the unwound film portion along the unwinding path. Indeed, at least part of the tensioning force applied by the tensioning device is transferred by the unwound film portion along the unwinding path such that the tensioning force contributes to the unwinding of the film portion from the reel.

During operation of the above apparatus, the film may not be correctly unwound from the reel or the unwound film portion may break along the unwinding path, thus making it necessary to stop the operation of the apparatus. As a matter of fact, the proper functioning of the known apparatuses described above depends on several factors such as the film material and the uniformity of the coils forming the reel: indeed, the efficiency of the unwinding varies as the properties of film material to unwind changes. Using the apparatus of the state of the art, reels in which the different coils are strongly bonded to each other are more difficult to unwind with respect of reels in which the coils are loosely bonded. Consequently, since the known apparatuses may present drawbacks during the unwinding of the former

reels and instead work correctly with the latter, the efficiency of the known apparatuses is variable and thus not predictable.

OBJECT OF THE INVENTION

The object of the present invention is to solve the drawbacks and/or limitations of the above prior art.

An object of the present disclosure is to provide an apparatus and a related method capable of increasing the unwinding efficiency.

Another object is to provide an apparatus and a method capable of reducing downtimes.

A further object is to provide more versatile apparatus and methods capable of unwinding a large variety of film materials.

Another object of the present disclosure is to provide a simple apparatus and a method that can be easily implemented on known packaging machines.

SUMMARY

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

Therefore, in a first aspect thereof, an apparatus for unwinding a portion of a packaging film from a reel couplable to a packaging machine comprises:

a support roller configured to engage a reel and rotate the reel around an unwinding axis,

a first roller extending along and being rotatable around a first axis of rotation, the first roller being configured to contact an external surface of the reel and to unwind a film portion from the reel and feed the unwound film portion along an unwinding path.

In a 2nd aspect in accordance with the preceding aspect, the first roller is movable between a plurality of positions to maintain contact between the first roller and the external surface of the reel as the reel is unwound.

In a 3rd aspect in accordance with the preceding aspect, the apparatus comprises a support structure holding ends of the first roller and configured to position the first roller at a respective distance from the unwinding axis of the support roller in each one of the plurality of positions taken by the first roller as the reel is unwound.

In a 4th aspect in accordance with the preceding aspect, the support structure holds the first roller for movement along a trajectory transverse to the first axis of rotation and/or to the unwinding axis and having at least a vertical component.

In a 5th aspect in accordance with the preceding aspect, the trajectory has a vertical component and a horizontal component.

In a 6th aspect in accordance with any one of the two preceding aspects, the trajectory is perpendicular to the unwinding axis and/or to the first axis of rotation.

In a 7th aspect in accordance with the preceding aspect, the support structure comprises a guide defining the trajectory, the first roller ends being coupled to the guide for moving along the guide as the reel is unwound.

In an 8th aspect in accordance with any one of the preceding aspects from the 2nd to the 6th, the apparatus comprises a frame and the support structure comprises a bar hinged to the frame at a first end and connected to the first roller at an opposite end, the bar being configured to rotate as the first roller moves between a plurality of positions.

In a 9th aspect in accordance with any one of the preceding aspects from the 3rd to the 8th, the support structure is configured to hold the first roller leaving the first roller freedom to move between the plurality of positions at least in part by gravity.

In a 10th aspect in accordance with any one of the preceding aspects from the 2nd to the 9th, the distance of the first roller from the unwinding axis of the support roller changes in each of the plurality of positions and adapts to a current dimension of the reel.

In a 11th aspect in accordance with any one of the preceding aspects, the apparatus comprises a tensioning device coupled to the support roller and to the first roller, the tensioning device being configured for receiving an unwound film portion from the first roller and applying a tensioning force to the unwound film portion along the unwinding path,

In a 12th aspect in accordance with the preceding aspect, the relative position between the first roller and the tensioning device at any one of the plurality of positions of the first roller is such that the first roller is configured for rotating the unwound film portion around the first axis of rotation of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

In a 13th aspect in accordance with any one of the preceding aspects, the first roller comprises a core and a gripping coating, the gripping coating forming a gripping surface, wherein the gripping surface is configured to contact the external surface of the reel.

In a 14th aspect in accordance with the preceding aspect, the gripping coating is at least in part made of rubber.

In a 15th aspect in accordance with any one of the preceding aspects, the apparatus comprises a second roller adjacent to and configured to cooperate with the first roller, the second roller extending along and being rotatable around a second axis of rotation parallel to the first axis of rotation, the second roller being configured to receive from the first roller and feed along the unwinding path the unwound film portion.

In a 16th aspect in accordance with the preceding aspect, the relative position between the first roller and the second roller at any one of the plurality of positions of the first roller is such that the second roller is configured for rotating the unwound film portion around the second axis of rotation of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

In a 17th aspect in accordance with any one of the two preceding aspects, the second roller is configured to guide the unwound film portion along the unwinding path against the reel.

In a 18th aspect in accordance with any one of the three preceding aspects, the apparatus comprises a third roller adjacent to and configured to cooperate with the second roller, the third roller extending along and being rotatable around a third axis of rotation parallel to the first axis of rotation, the third roller being configured to

receive the unwound film portion from the second roller and to guide the unwound film portion along the unwinding path against the reel.

In a 19th aspect in accordance with the preceding aspect, the third roller is configured to contact the reel and/or to compress at least in part the unwound film portion against the reel.

In a 20th aspect in accordance with the preceding aspect, the third roller is coupled to the first roller to move along a respective trajectory as the first roller moves between the plurality of positions.

In a 21st aspect in accordance with the preceding aspect, the third roller is at a respective distance from the unwinding axis of the support roller in each one of the plurality of positions taken by the first roller as the reel is unwound.

In a 22nd aspect in accordance with any one of the preceding aspects, one of the first roller and the third roller comprises a core and a gripping coating, the gripping coating forming a gripping surface, wherein the gripping surface is configured to contact the external surface of the reel.

In a 23rd aspect in accordance with any one of the preceding aspects, the unwinding axis and the first axis of rotation are parallel to each other.

In a 24th aspect in accordance with any one of the preceding aspects, the first roller is idle, and the support roller is motorized.

In a 25th aspect in accordance with any one of the preceding aspects, the first roller or the second roller or the third roller is motorized.

In a 26th aspect in accordance with any one of the preceding aspects, the first roller or the second roller or third roller is idle.

In a 27th aspect in accordance with any one of the preceding aspects, the first roller is configured to cause a compression force against the reel, a modulus of the compression force being at least in part based on a weight of the first roller.

In a 28th aspect in accordance with any one of the preceding aspects when combined with the 18th aspect, the third roller is configured to cause an additional compression force against the reel, the modulus of the additional compression force being at least in part based on a weight of third roller.

In a 29th aspect in accordance with the preceding aspect, the third roller is configured to cause the additional compression force against the reel through the unwound film portion.

A 30th aspect is related to a packaging machine comprising:

an apparatus according to any one of the preceding aspects, and

a packaging station configured to receive consecutive film portions from the apparatus and to form packages using said film portions.

A 31st aspect is related to a method of unwinding a portion of a packaging film from a reel using the apparatus according to any one of the preceding aspects from the 1st to the 29th, comprising the steps of:

- providing the apparatus with the reel with the first roller into contact with the external surface of the reel,

- rotating the reel around the unwinding axis and unwinding a film portion through the first roller,

- guiding the unwound film portion along the unwinding path,

wherein, while unwinding the film portion, the first roller is moved between the plurality of positions.

In a 32nd aspect in accordance with the preceding aspect, the method comprises the step of positioning the first roller at a respective distance from the unwinding axis of the support roller in each one of the plurality of positions taken by the first roller as the reel is unwound, while maintaining contact between the first roller and the external surface of the reel.

In a 33rd aspect in accordance with any one of the two preceding aspects, the method comprises the step of moving the first roller along a trajectory transverse to the first axis of rotation and/or to the unwinding axis and having at least a vertical component.

In a 34th aspect in accordance with any one of the three preceding aspects, the first roller is moved between the plurality of positions by gravity.

In a 35th aspect in accordance with any one of the four preceding aspects, the method comprises the step of rotating the unwound film portion around the first axis of rotation of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

In a 36th aspect in accordance with any one of the five preceding aspects, wherein the apparatus is in accordance with to any one of the preceding aspects from the 1st to the 29th when combined with the 15th aspect, the method further comprises the step of rotating the unwound film portion around the second axis of rotation of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

In a 37th aspect in accordance with any one of the six preceding aspects, wherein the each one of the support roller, the first, the second and the third rollers have respective directions of rotation around respectively the unwinding axis and the first, second and third axes of rotation, and wherein the method comprises the steps of:

- rotating the support roller and the first roller with opposite directions of rotation,
- rotating the second roller with the respective direction of rotation equal to the direction of rotation of the support roller,
- rotating the third roller with the respective direction of rotation equal to the direction of rotation of the first roller.

In a 38th aspect in accordance with any one of the preceding aspects from the 31st to the 37th, the step of guiding the unwound film portion along the unwinding path comprises the step of guiding the unwound film portion against the reel.

In a 39th aspect in accordance with any one of the preceding aspects from the 31st to the 38th, the step of guiding the unwound film portion along the unwinding path comprises the steps of:

- guiding the unwound film portion along the unwinding path from a first detachment zone of the reel along a first section of an unwinding path away from the reel,
- guiding the unwound film portion along a second section of the unwinding path against the reel at a contact zone,
- detaching the unwound film portion from the reel at a second detachment zone of the reel,

wherein the first detachment zone, the second detachment zone and the contact zone are different from each other.

A 40th aspect is directed to a method of unwinding a portion of packaging film from a reel comprising the steps of:

- unwinding a film portion from the reel at a first detachment zone of the reel,
- guiding the unwound film portion along an unwinding path from the first detachment zone along a first section of an unwinding path away from the reel,
- guiding the unwound film portion along a second section of the unwinding path against the reel at a contact zone,
- detaching the unwound film portion from the reel at a second detachment zone of the reel,

wherein the first detachment zone, the second detachment zone and the contact zone are different from each other.

In a 41st aspect in accordance with the preceding aspect, the method comprises the step of rotating the reel around an unwinding axis, optionally the method further comprises the step of providing a support roller configured to engage the reel and rotate the reel around the unwinding axis.

In a 42nd aspect in accordance with any one of the two preceding aspects, the method comprises the step of guiding the unwound film portion against a first roller extending along and being rotatable around a first axis of rotation, the first roller being configured to contact an external surface of the reel and to unwind a film portion from the reel and feed the unwound film portion along the unwinding path.

In a 43rd aspect in accordance with the preceding aspect, the first section of the unwinding path is at least in part defined by the first roller, preferably the first section of the unwinding path being at least in part defined at a surface of the first roller.

In a 44th aspect in accordance with any one of the preceding aspects from the 40th to the 43rd, the method comprises the step of guiding the unwound film portion against a second roller adjacent to and configured to cooperate with the first roller, the second roller extending along and being rotatable around a second axis of rotation parallel to the first axis of rotation, the second roller being configured to receive from the first roller and feed along the unwinding path the unwound film portion.

In a 45th aspect in accordance with the preceding aspect, the first section of the unwinding path is at least in part defined by the second roller, preferably the first

section of the unwinding path being at least in part defined at a surface of the second roller.

In a 46th aspect in accordance with any one of the preceding aspects from the 40th to the 45th, the method comprises the step of guiding the unwound film portion against a third roller adjacent to and configured to cooperate with the second roller, the third roller extending along and being rotatable around a third axis of rotation parallel to the first axis of rotation, the third roller being configured to receive the unwound film portion from the second roller and to guide the unwound film portion along the unwinding path against the reel.

In a 47th aspect in accordance with the preceding aspect, the first section of the unwinding path is at least in part defined by the third roller, preferably the first section of the unwinding path being at least in part defined at a surface of the third roller.

In a 48th aspect in accordance with any one of the preceding aspects from the 40th to the 47th, the method comprises one or more of the steps of:

- rotating the unwound film portion around a first axis of rotation, preferably of at least 90°, preferably at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°,
- rotating the unwound film portion around a second axis of rotation, preferably of at least 90°, preferably at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°,
- rotating the unwound film portion around a third axis of rotation.

In a 49th aspect in accordance with any one of the preceding aspects from the 40th to the 48th, the second section of the unwinding path is defined at least in part by the reel, preferably the second section of the unwinding path being at least in part defined at an external surface of the reel.

In a 50th aspect in accordance with any one of the preceding aspects from the 40th to the 49th, the first and second sections are successive sections of the unwinding path, preferably the first and second sections are consecutive sections of the unwinding path.

In a 51st aspect in accordance with any one of the preceding aspects from the 40th to the 50th, the second section of the unwinding path follows the first section along the unwinding path.

In a 52nd aspect in accordance with any one of the preceding aspects from the 40th to the 51st, the first section of the unwinding path is defined between the first detachment zone and the contact zone.

In a 53rd aspect in accordance with any one of the preceding aspects from the 40th to the 52nd, the second section of the unwinding path is defined at the contact zone and between the contact zone and the second detachment zone.

In a 54th aspect in accordance with any one of the preceding aspects from the 40th to the 53rd, the method comprises the step of guiding the unwound film portion along the unwinding path from the second detachment zone along a third section of the unwinding path away from the reel.

In a 55th aspect in accordance with the preceding aspect, the second and third sections are successive sections of the unwinding path, preferably the second and third sections are consecutive sections of the unwinding path.

In a 56th aspect in accordance with any one of the preceding aspects from the 54th to the 55th, the third section of the unwinding path follows the second section along the unwinding path.

In a 57th aspect in accordance with any one of the preceding aspects from the 40th to the 56th, the method comprises the steps of:

- providing a tensioning device configured for receiving the unwound film portion and applying a tensioning force to the unwound film portion along the unwinding path,
- guiding the unwound film portion from the second detachment zone to the tensioning device along the unwinding path.

In a 58th aspect in accordance with the preceding aspect when combined with any one of the preceding aspects from the 54th to the 56th, the third section of the unwinding path is defined between the second detachment zone and the tensioning device.

In a 59th aspect in accordance with any one of the preceding aspects from the 40th to the 58th, one or more of the steps of the method are executed by an apparatus in accordance with any one of the preceding aspects from the 1st to the 30th.

In a 60th aspect in accordance with any one of the preceding aspects from the 40th to the 58th, the method comprises one or more of the steps of the method in accordance with any one of the preceding aspects from the 31st to the 39th.

A 59th aspect concerns a packaging process comprising:

unwinding a portion of a packaging film (5) from a reel (2) using the method of any one of above aspects from the 31st to the 59th;

feeding the unwound portion of film (5) and one or more products to be packaged to a packaging station;

at the packaging station using the unwound portion of film to form one or more packages housing one or more respective products.

In a 60th aspect according to the preceding aspect the one or more packages are formed under a controlled atmosphere or under vacuum.

In a 61st aspect according to any one of the preceding two aspects, wherein the one or more packages are in the form of bags.

In a 62nd aspect according to the preceding aspect the bags are entirely formed by said one unwound portion of film (5).

In a 63rd aspect according to any one of aspects 59th or 60th each one of the one or more packages includes a tray or support and a part of the unwound film portion applied thereto to enclose the product.

In a 64th aspect according to any one of aspects from 59th to 63rd, packaging machine is of the type according to the 30th aspect.

BRIEF DESCRIPTION OF THE DRAWING

Some embodiments and some aspects of the invention are described hereinafter with reference to the accompanying drawings, provided only for illustrative and, therefore, non-limiting purposes, in which:

- Figs. 1 and 2 depict a schematic side view of an apparatus respectively in two different configurations in accordance with a first embodiment described herein;

- Fig. 3 depicts a schematic side view of an apparatus in accordance with a second embodiment described herein;
- Fig. 4 is a schematic side view of an apparatus in accordance with a third embodiment described herein;
- Fig. 5 depicts a schematic side view of an apparatus in accordance with a fourth embodiment described herein;
- Fig. 6 is a schematic perspective view of the apparatus shown in Fig. 5 with some elements removed to better show others;
- Fig. 7 is a perspective view of the apparatus shown in Fig. 3 with some elements removed to better show others;
- Fig. 8 is a perspective view of a packaging machine comprising the apparatus of Fig. 3;
- Fig. 9. depicts a schematic view of a packaging machine comprising the apparatus of Fig. 1.

DETAILED DESCRIPTION

The present disclosure describes an apparatus 1 for unwinding a portion of a packaging film from a reel. In detail, all the embodiments of the apparatus described herein are couplable to a packaging machine.

The packaging film may be fed by the apparatus to a packaging station for it to be applied to a tray of support to form a lid onto the tray (e.g. for MAP – modified atmosphere packaging) or a skin associated to the tray and matching the contour of a product contained into the tray. The packaging film may be fed to a packaging station, for example a bag making station, for making bags or pouches adapted for containing a product. The packaging film may be a tubular film wound to form coils of the reel such that each unwound film portion is a portion of the tubular film.

In other words, the packaging film may be used for forming the containers (e.g., bags or pouches) and packages and it may be made of plastic material, in particular polymeric material. The packaging film is, for example, a flexible mono or multilayer material comprising at least a heat-weldable layer. In case of a multilayer film, the film may include an optional gas barrier layer and a one or more protective layers. The packaging film may be a heat-shrinkable plastic. As used herein the terminology

"heat-shrinkable", "heat-shrink", and the like, refer to the tendency of film to shrink upon the application of heat, such that the size of the film decreases while the film is in an unrestrained state.

The apparatus 1 comprises a support roller 3 which is configured to engage a reel 2 and rotate the reel 2 around an unwinding axis X. In detail, the support roller 3 is a motorized roller able to put into rotation the reel 2 around the unwinding axis.

The apparatus 1 comprises a first roller 4 which extends along and is rotatable around a first axis of rotation Y. The first axis of rotation may be parallel to the unwinding axis of the support roller 3. The first roller 4 is configured to contact an external surface 2a of the reel 2 and to unwind a film portion from the reel 2 and feed the unwound film portion 5 along an unwinding path A.

In detail, the first roller 4 is movable between a plurality of positions to maintain contact between the first roller 4 and the external surface 2a as the reel 2 is unwound. In other words, as the reel 2 is unwound and, therefore its dimension decreases, the first roller 4 may move between the plurality of positions in such a way to maintain the contact with the external surface 2a of the reel 2.

This is advantageous as the first roller 4 can contact the external surface 2a of the reel 2 in any unwinding and consumption state of the reel 2, for example regardless of how many wound coils the reel has.

In an embodiment, the first roller 4 is idle, and the support roller 3 is motorized. In detail, the first roller 4 is put into rotation around the first axis of rotation by the contact with the reel which is driven by the support roller. Indeed, the contact with the moving external surface of the reel drives the first roller into rotation. In some embodiments, the first roller 4 may be motorized and the support roller 3 idle or both of the first roller 4 and support roller 3 may be motorized.

In an embodiment, the apparatus comprises a support structure 6 holding ends of the first roller 4 and configured to position the first roller 4 at a respective distance from the unwinding axis X of the support roller 3 in each one of the plurality of positions taken by the first roller 4 as the reel 2 is unwound. In detail, the first roller 4 is at a respective distance from the support roller 3 in each one of the plurality of positions. In other words, each one of the plurality of positions of the first roller 4 is

associated with a respective distance of the first roller 4 from the unwinding axis X of the support roller 3.

More in detail, the support structure 6 is configured to position the first roller 4 in such a way that the distance between the first roller 4 and the unwinding axis X decreases as the reel 2 is unwound.

Figs. 1 and 2 show the first roller 4 in two different positions of the plurality of positions with the distance of the first roller 4 from the unwinding axis X being greater in figure 1 than in figure 2. In detail, figure 2 shows the apparatus in a state in which the reel 2 has fewer wound coils with respect to the reel of figure 1. The periphery of the reel 2 and the position of the first roller 4 of figure 1 are reported in figure 2 with dashed lines to better show how the first roller 4 may adapt its position as the reel 2 is unwound.

The first roller 4 is configured to move between the plurality of positions decreasing its distance from the support roller 3 as the reel 2 is unwound. In other words, since the diameter of the reel 2 decreases as the reel 2 is unwound, the first roller 4 maintains the contact with the external surface 2a of the reel 2 by moving between the plurality of positions, thus, decreasing the distance from the unwinding axis X of the support roller 3. The first roller 4 is configured to move towards the support roller 3 as the reel 2 is unwound.

In some embodiments, the support structure 6 holds the first roller 4 for movement along a trajectory transverse to the first axis of rotation Y and/or to the unwinding axis X and having at least a vertical component. In detail, the trajectory may be perpendicular to the first axis of rotation and/or to the unwinding axis X. More in detail, the trajectory of the first roller 4 has a vertical component and a horizontal component. The trajectory may have any shape allowing the first roller 4 to move between the plurality of positions towards and away from the support roller 3. The trajectory may be curved or linear. In detail, the support structure 6 defines the trajectory.

The apparatus 1 may comprise a frame 7 coupled to the support roller 3, first roller 4 and to the support structure 6.

In an embodiment, the support structure 6 comprises a guide defining the trajectory. In detail, the first roller ends are coupled to the guide for moving along the guide as

the reel 2 is unwound. More in detail, the guide may be fixed to the frame 7 of the apparatus. In addition, the guide may be defined by the frame 7 of the apparatus. The guide may comprise a rail and the ends of the first roller 4 may be coupled to the rail and configured to move along the rail.

In an embodiment, the support structure 6 comprises a bar 8 hinged to the frame 7. The bar 8 is hinged to the frame 7 at a first end 8a and connected to the first roller 4 at an opposite end 8b. The bar 8 may be configured to rotate as the first roller 4 moves between a plurality of positions. In detail, the bar 8 is configured to rotate around the hinged first end 8a as the first roller 4 moves between the plurality of positions.

In addition, the support structure 6 comprises coupling elements at the opposite end 8b of the bar 8 through which the first roller 4 is connected to the bar 8. More in detail, the bar 8 comprises a plate at the opposite end 8b. The coupling element are at the plate of the bar 8. The coupling elements comprises a bearing and a through hole for connecting the bar 8 with one of the first roller ends. In detail, the support structure 6 comprises two bars as described herein wherein each bar 8 is respectively coupled to one of the first roller ends.

In some embodiments, the support structure 6 is configured to hold the first roller 4 leaving the first roller 4 freedom to move between the plurality of positions at least in part by gravity. In detail, the distance of the first roller 4 from the unwinding axis X of the support roller 3 changes in each of the plurality of positions and adapts to a current dimension of the reel 2. In detail, the distance of the first roller 4 from the unwinding axis X adapts to a current diameter of the reel 2.

More in detail, in use, the first roller 4 is placed and maintained against the reel 2 as the reel 2 is unwound by gravity. In other words, the weight of the first roller 4 allows the first roller 4 to move between the plurality of positions to maintain the contact with the external surface 2a of the reel 2.

Advantageously, since the first roller is configured to move between the plurality of positions by gravity, the movement of the first roller is automatic and motorless. Thus, the apparatus does not require the presence of a motor and respective control system or of qualified personnel to maintain the contact between the first roller 4 and the external surface 2a of the reel 2.

In more detail, the first roller 4 is configured to apply a compression force to the reel 2. In particular, the modulus of the compression force is at least in part based on the weight of the first roller 7.

In some embodiments, the support structure comprises a loading element coupled to the bar 8. The loading element may be a spring or a piston connected to the bar. The loading element may be configured to drive the first roller 4 along the trajectory towards the support roller 3. In detail, the loading element is configured to apply, through the bar 8, a driving force to the first roller for driving the first roller towards the support roller.

In an embodiment, the support structure 6 comprises a hook 13 hinged to the frame 7 and the bar 8 comprises a pin 14 at the opposite end 8b. The hook 13 is configured to couple with the pin 14 of the bar 8 to lock the support structure 6 and the first roller 4 in a non-operating position. The movement of the first roller 4 between the plurality of positions is prevented when the first roller 4 is locked in the non-operating position.

Advantageously, the hook 13 and pin 14 allow to lock the support structure and the first roller in a non-operating position in which the first roller does not contact the external surface of the reel.

The non-operating position allows an operator to easily change the reel 2 from the support roller 3 whenever it is needed. The ability to lock the first roller 4 in a non-operating position increases the safety of the apparatus and allows an operator to deactivate the functioning of the first roller 4 whenever it is needed, for example during maintenance to the apparatus, changes of the reel 2 or even when the apparatus is not functioning.

In an embodiment, the apparatus comprises a tensioning device 9 coupled to the support roller 3 and to the first roller 4. The tensioning device 9 is configured for receiving an unwound film portion 5 from the first roller 4 and applying a tensioning force to the unwound film portion 5 along the unwinding path A.

In detail, the tensioning device 9 may comprise a dancer roller. The tensioning device 9 is configured to applying a tensioning force that is transferred along the unwinding path A by the unwound film portion 5. When the first roller 4 is idle, the tensioning force is at least in part transferred from the tensioning device 9 to the

reel 2. The tensioning force contributes to the unwinding of the film portion from the reel 2.

The relative position between the first roller 4 and the tensioning device 9 in each one of the plurality of positions of the first roller 4 may be such that the first roller 4 is configured for rotating the unwound film portion 5 around the first axis of rotation Y of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

Advantageously, rotating the unwound film portion around the first axis of rotation of at least 90°, preferably of at least 180° or 200°, allows the tensioning force to contribute for easily detaching the film portion from the reel 2.

In some embodiments, the relative position between the first roller 4 and the tensioning device 9 in each one of the plurality of positions is such that the unwound film portion 5 wraps around the first roller 4 to cover at least 30% of the gripping surface, preferably at least 40%, even more preferably at least 50%.

In an embodiment, the first roller 4 comprises a core and a gripping coating. The gripping coating forms a gripping surface 10. The gripping surface 10 may be configured to contact the external surface 2a of the reel 2. In detail, the first roller 4 contacts the external surface of the reel 2 through the gripping surface 10.

Moreover, the gripping coating may be at least in part made of rubber. The rubber may be natural rubber or synthetic rubber. The gripping coating may be made of any material capable of increasing the gripping between the first roller 4 and the unwound film portion 5 and/or the reel 2.

Advantageously, the gripping coating of the first roller 4 increases the gripping between the first roller 4 and the external surface 2a of the reel 2, thus reducing the chances of having a sliding of the unwound film portion 5 on the first roller surface and thus increasing the unwinding efficiency of the apparatus.

In some embodiments (see for example figures 3-7), the apparatus comprises a second roller 11 adjacent to and configured to cooperate with the first roller 4. In particular, the second roller 11 extends along and is rotatable around a second axis of rotation W. The second axis of rotation W may be parallel to the first axis of rotation Y and to the unwinding axis X.

In detail, the second roller 11 may be configured to receive from the first roller 4 and feed along the unwinding path A the unwound film portion 5. The second roller 11 may be either motorized or idle.

The second roller 11 may be coupled to the support structure 6. In detail, the ends of the second roller are coupled to the bars 8 of the support structure 6 or to the guide.

In some embodiment, the second roller 11 is configured to move along a trajectory as the first roller 4 moves between the plurality of positions. In addition, the second roller 11 may have a core and a gripping coating.

In an embodiment, the relative position between the first roller 4 and the second roller 11 in each one of the plurality of positions of the first roller 4 is such that the second roller 11 is configured for rotating the unwound film portion 5 around the second axis of rotation W of at least 90°. In some embodiments, the relative position between the first roller 4 and the second roller 11 is such that the second roller 11 is configured for rotating the unwound film portion 5 around the second axis of rotation W of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°. The relative position between the second roller 11 and the first roller 4 may be fixed.

In some embodiments (see figures 3-5), the apparatus 1 comprises additional rollers 15 coupled to or cooperating with the second roller 11 and configured to receive the unwound film portion 5 from the second roller 11. The additional rollers 15 are configured to guide the unwound film portion 5 from the second roller 11 to the tensioning device 9 along the unwinding path A. Each one of the additional rollers 15 may either be idle or motorized and have a core and a gripping coating.

For example, each one of the apparatuses shown in figure 3 and 5 comprises respectively two or three additional rollers 15, while the apparatus of figure 4 comprises five additional rollers 15.

In the examples of figures 3 and 5 the additional rollers 15 are positioned at a distance from the surface of reel 2 and configured to receive the unwound film portion after this latter has left the reel surface (i.e., after the second detachment point 22 described below) and to guide the unwound film portion to the tensioning device, for example along a trajectory developing below the unwinding axis X of the

support roller 3. Note that in the examples of figures 3 and 5 two of the additional rollers may be defined by adjacent and counter-rotating rollers 15', cooperating to receive the unwound film portion in the nip defined between them and properly guide the unwound film portion towards the tensioning device 9. The third roller may or may not be present and the trajectory of the unwound film portion may the one shown in dash lines in figures 3 and 5, with the unwound film portion moving directly from the detachment point 22 to the couple of adjacent counterrotating rollers 15'.

In the example of figure 4 the additional rollers 15 are positioned at a distance from the surface of reel 2 and configured to receive the unwound film portion after this latter has left the second roller 11 and to guide the unwound film portion to the tensioning device, for example along a trajectory developing above, on one side and below the unwinding axis X of the support roller 3. Note that in the example of figure 4 two of the additional rollers may be defined by adjacent and counter-rotating rollers 15', cooperating to receive the unwound film portion in the nip defined between them and properly guide the unwound film portion towards the tensioning device 9. The other three rollers 15 are positioned at a distance form each other around the roller 3 (and thus around reel 2) to guide the unwound film portion in part around and then below the roller 3 and reel 2, as shown in figure 4.

As shown in figure 3, the second roller 11 may be configured to guide the unwound film portion 5 along the unwinding path A against the reel 2. Once the unwound film portion 5 is fed to the second roller 11 by the first roller 4, the second roller 11 is configured to feed the unwound film portion 5 along the unwinding path in such a way that the unwound film portion contacts the reel 2 in its movement along the unwinding path A. In other words, the unwinding path A comprises a section which is in contact with the reel. In particular, the unwinding path A is at least in part defined by the reel 2.

Advantageously, guiding the unwound film portion 5 against the reel 2 allow the use of the periphery of the reel 2 to guide the unwound film portion 5 along the unwinding path A without needing further rollers.

As shown in figure 5, the apparatus may comprise a third roller 12 adjacent to and configured to cooperate with the second roller 11. The third roller 12 extends along and is rotatable around a third axis of rotation Z. The third axis of rotation Z may be parallel to the first axis of rotation Y. Moreover, the third roller 12 may be configured to receive the unwound film portion 5 from the second roller 11 and to guide the unwound film portion 5 along the unwinding path A against the reel 2.

The third roller 12 may be either motorized or idle and it may have a core and a gripping coating. In addition, the third roller 12 may be coupled to the support structure 6. In more detail, the third roller 12 is coupled to the bar 8 or to the guide to move towards and away from the unwinding axis X as the first roller 4 moves between the plurality of positions. In detail, the third roller 12 is connected to the plate of the bar with the plate configured to leave the third roller freedom to move to maintain contact with the reel 2 as the reel is unwound.

In addition, the third roller 12 may be configured to contact the reel 2 and/or to compress at least in part the unwound film portion 5 against the reel 2. In particular, the third roller 12 may be configured to contact the reel 2 through the unwound film portion 5. In other words, the third roller 12 may be configured to compress at least in part the unwound film portion 5 against the reel 2. The third roller may be configured to contact the reel by gravity.

In some embodiments, the third roller 12 is configured to apply an additional compression force to the reel. The modulus of the additional compression force is based on the weight of the third roller. In addition, the modulus of the additional compression force may be based on the weight of the first, second and third rollers.

As the first roller, the third roller may move along a trajectory towards or away the unwinding axis X by gravity. For example, when the first roller 4 moves between the plurality of positions decreasing its distance to the unwinding axis X, also the third roller 12 may move towards the unwinding axis X.

As shown in figure 6, the first axis of rotation, the second axis of rotation, the third axis of rotation and the unwinding axis X are parallel to each other.

Further object of the present disclosure is a packaging machine 100 comprising an apparatus 1 as described herein and a packaging station 101 configured to receive

consecutive film portions from the apparatus and to form packages using said film portions.

The packaging station 101 may be configured for forming containers and packages for the packaging of products, for example food products. The packaging station 101 may package a product under a controlled atmosphere or under vacuum. In some embodiments, the packaging station may be configured for skin packaging of a product.

In an embodiment, the packaging station 101 is a bag making station configured for forming containers as bags and pouches using film portions received by the apparatus 1. The bag making station may be configured to receive the unwound film portion 5 from the apparatus and form bags of packaging film adapted to contain products.

With particular reference to figure 9, the packaging station 101 may be configured for applying the film portions to trays or supports 104 to form a lid onto the tray (e.g. for MAP- modified atmosphere packaging) or a skin associated to the tray and matching the contour of the product P. The packaging station 101 comprises a lower tool 102 configured for receiving supports 104 and an upper tool 103 configured for receiving the film portion to be associated to the supports 104 from the apparatus.

In some embodiments, the packaging station 101 is a thermoforming machine configured to receive the film portions from the apparatus and form trays or supports by thermoforming the received film portions.

A further object of the present disclosure is a method of unwinding a portion of a packaging film from a reel 2 using the apparatus 1 comprising the steps of:

- providing the apparatus 1 with the reel 2 with the first roller 4 into contact with the external surface 2a of the reel 2,
- rotating the reel 2 around the unwinding axis X and unwinding a film portion through the first roller 4,
- guiding the unwound film portion 5 along the unwinding path A.

In detail, while unwinding the portion of packaging film, the first roller 4 is moved between the plurality of positions.

In an embodiment, the method comprises the step of positioning the first roller 4 at a respective distance from the unwinding axis X of the support roller 3 in each one

of the plurality of positions taken by the first roller 4 as the reel 2 is unwound, while maintaining contact between the first roller 4 and the external surface 2a of the reel 2.

The method may further comprise the step of moving the first roller 4 along a trajectory transverse to the first axis of rotation Y and/or to the unwinding axis X and having at least a vertical component. Moreover, the trajectory may have a vertical component and a horizontal component. In detail, the first roller 4 is moved between the plurality of positions by gravity.

In an embodiment, the method comprises the step of rotating the unwound film portion 5 around the first axis of rotation X of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

In addition, the method further comprises the step of rotating the unwound film portion 5 around the second axis of rotation Y of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

In an embodiment, each one of the support roller, the first, the second and the third rollers have respective directions of rotation around respectively the unwinding axis and the first, second and third axes of rotation. The method may comprise the steps of:

- rotating the support roller 3 and the first roller 4 with opposite directions of rotation,
- rotating the second roller 11 with the respective direction of rotation equal to the direction of rotation of the support roller 3,
- rotating the third roller 12 with the respective direction of rotation equal to the direction of rotation of the first roller 4.

In detail, the first, second and third rollers may either be motorized or idle.

In an embodiment, the step of guiding the unwound film portion 5 along the unwinding path A comprises the step of guiding the unwound film portion 5 against the reel 2.

The method of the present disclosure may comprise the steps of:

- unwinding a film portion from the reel 2 at a first detachment zone 20 of the reel 2,
- guiding the unwound film portion 5 along the unwinding path A from the first detachment zone 20 of the reel 2 along a first section S1 of an unwinding path A away from the reel 2,
- guiding the unwound film portion 5 along a second section S2 of the unwinding path A against the reel 2 at a contact zone 21,
- detaching the unwound film portion 5 from the reel 2 at a second detachment zone 22 of the reel 2.

In detail, the first detachment zone 20, the second detachment zone 22 and the contact zone 21 are different from each other. The first detachment zone 20, the second detachment zone 22 and the contact zone 21 may be zones at the periphery of the reel 2 (as shown for example in figures 3 and 5, the first detachment zone 20, the contact zone 21 and the second detachment zone 22 are angularly consecutive on the periphery of reel 2, with the first detachment zone 20 and the contact zone 21 being separated as the unwinding path A of the unwound film portion follows the first section S1 between the first detachment zone 20 and the contact zone 21).

In particular, the step of guiding the unwound film portion 5 along the unwinding path A comprises the steps of guiding the unwound film portion 5 along the first section and the second section S1 and S2.

In detail, the first section S1 of the unwinding path is at least in part defined by the first roller 4 and, when present, by the second roller 11 and by the third roller 12. The first section of the unwinding path may be at least in part defined at a surface of the first roller 4 and, when present, of the second roller 11 and of the third roller 12. In particular, the first section is in part defined at the gripping surface 10 of the first, second and third rollers.

In detail, the first section of the unwinding path is defined between the first detachment zone 20 and the contact zone 21. For example, in the apparatus shown in figure 3, the first section of the unwinding path is defined by the first and second rollers between the first detachment 20 zone and the contact zone 21 of the reel 2.

As shown in the examples of figures 3 and 5, the second section S2 of the unwinding path may be defined by the reel (for example by a peripheral tract of the reel 2). In

detail, the second section S2 of the unwinding path A may be at least in part defined at the external surface of the reel. Moreover, the second section S2 of the unwinding path may be defined at the contact zone 21 and/or between the contact zone 21 and the second detachment zone 22.

The first section and the second section S1, S2 of the unwinding path may be successive sections of the unwinding path A. In detail, the first section and the second section S1 and S2 are consecutive sections of the unwinding path A. In particular, the second section S2 follows the first section S1 along the unwinding path.

In the exemplifying embodiments of figures 3 and 5, the method comprises the step of guiding the unwound film portion along the unwinding path from the second detachment zone 22 along a third section S3 of the unwinding path A away from the reel 2. For example, the third section S3 of the unwinding path A may be defined from the second detachment zone to the tensioning device 9.

In detail, the unwinding path A may in this case comprise a third section S3 following the second section S2 along the unwinding path A. The second and third sections are successive sections of the unwinding path. More in detail, the second and third sections are consecutive sections of the unwinding path. The third section may be defined between the second detachment zone 22 and the tensioning device 9.

According to a further aspect, a packaging process is disclosed using the apparatus 1 for feeding film 5 to a packaging station (for example the packaging station 101 described above) where film 5 is used for forming packages for the packaging of products, for example food products. As already mentioned, the packaging station 101 may package a product under a controlled atmosphere or under vacuum. In some embodiments, the packaging station may be configured for skin packaging of a product.

In an embodiment, the packaging station 101 is a bag making station and the packaging metod comprises unrolling film portions of film 5 by the apparatus 1, feeding said film portions at the packaging station 101 and, at the packaging station 101, using the film portions received by the apparatus 1 for forming containers as bags and pouches. The bag making station may be configured to receive the

unwound film portion 5 from the apparatus and form bags of packaging film containing products, such as food products.

In the example of 9, the packaging station 101 may be configured for applying the film portions to trays or supports 104 to form a lid onto the tray (e.g. for MAP-modified atmosphere packaging) or a skin associated to the tray and matching the contour of the product P. The packaging station 101 comprises a lower tool 102 configured for receiving supports 104 and an upper tool 103 configured for receiving the film portion to be associated to the supports 104 from the apparatus. In this case the packaging process comprises receiving the trays/supports (e.g., from a tray/support feeder not shown), positioning a product on each of the trays/supports, receiving the film portions from the apparatus 1 and then applying a respective film portion to each one of the trays or supports for forming a package.

In other embodiments, the packaging station 101 may include a thermoforming machine configured to receive film portions of a bottom film from the apparatus 1 and form trays or supports by thermoforming the received film portions. A further apparatus 1 may be used to supply a top film which is fed to a sealing machine of the packaging station (for example operative downstream the thermoforming machine and a product loading station configured to load products on the formed trays/supports): the sealing machine is configured for applying portions of the top film to the trays/supports forming respective packages.

CLAIMS

1. Apparatus (1) for unwinding a portion of a packaging film from a reel (2) couplable to a packaging machine, comprising:

a support roller (3) configured to engage a reel (2) and rotate the reel (2) around an unwinding axis (X),

a first roller (4) extending along and being rotatable around a first axis of rotation (Y), the first roller (4) being configured to contact an external surface (2a) of the reel (2) and to unwind a film portion from the reel (2) and feed the unwound film portion (5) along an unwinding path (A),

wherein the first roller (4) is movable between a plurality of positions to maintain contact between the first roller (4) and the external surface (2a) of the reel (2) as the reel (2) is unwound.

2. Apparatus according to claim 1, comprising a support structure (6) holding ends of the first roller and configured to position the first roller (4) at a respective distance from the unwinding axis (X) of the support roller (3) in each one of the plurality of positions taken by the first roller (4) as the reel (2) is unwound.

3. Apparatus (1) according to the preceding claim, wherein the support structure (6) holds the first roller (4) for movement along a trajectory transverse to the first axis of rotation (Y) and/or to the unwinding axis (X) and having at least a vertical component.

4. Apparatus (1) according to the preceding claim, wherein the support structure (6) comprises a guide defining the trajectory, the first roller ends being coupled to the guide for moving along the guide as the reel (2) is unwound.

5. Apparatus (1) according to any one of the preceding claims 2 to 4, comprising a frame (7), the support structure (6) comprising a bar (8) hinged to the frame (7) at a first end (8a) and connected to the first roller (4) at an opposite end (8b), the bar (8)

being configured to rotate as the first roller (4) moves between a plurality of positions.

6. Apparatus (1) according to any one of the preceding claims 2 to 5, wherein the support structure (6) is configured to hold the first roller (4) leaving the first roller (4) freedom to move between the plurality of positions at least in part by gravity, optionally wherein the distance of the first roller (4) from the unwinding axis (X) of the support roller (3) changes in each of the plurality of positions and adapts to a current dimension of the reel (2).

7. Apparatus (1) according to any one of the preceding claims, comprising a tensioning device (9) coupled to the support roller (3) and to the first roller (4), the tensioning device (9) being configured for receiving an unwound film portion (5) from the first roller (4) and applying a tensioning force to the unwound film portion (5) along the unwinding path (A), and/or wherein the first roller (4) is idle and the support roller (3) is motorized.

8. Apparatus (1) according to the preceding claim, wherein the relative position between the first roller (4) and the tensioning device (9) at any one of the plurality of positions of the first roller (4) is such that the first roller (4) is configured for rotating the unwound film portion (5) around the first axis of rotation (Y) of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

9. Apparatus (1) according to any one of the preceding claims, wherein the first roller (4) comprises a core and a gripping coating, the gripping coating forming a gripping surface (10), wherein the gripping surface (10) is configured to contact the external surface (2a) of the reel (2), preferably the gripping coating being at least in part made of rubber.

10. Apparatus (1) according to any one of the preceding claims, comprising a second roller (11) adjacent to and configured to cooperate with the first roller (4),

the second roller (11) extending along and being rotatable around a second axis of rotation (W) parallel to the first axis of rotation (Y), the second roller (11) being configured to receive from the first roller (4) and feed along the unwinding path (A) the unwound film portion (5),

optionally wherein the relative position between the first roller (4) and the second roller (11) at any one of the plurality of positions of the first roller (4) is such that the second roller (11) is configured for rotating the unwound film portion (5) around the second axis of rotation (W) of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°.

11. Apparatus (1) according to the preceding claim, wherein the second roller (11) is configured to guide the unwound film portion (5) along the unwinding path (A) against the reel (2), and/or

wherein the apparatus (1) comprises a third roller (12) adjacent to and configured to cooperate with the second roller (11), the third roller (12) extending along and being rotatable around a third axis of rotation (Z) parallel to the first axis of rotation (Y), the third roller (12) being configured to receive the unwound film portion (5) from the second roller (11) and to guide the unwound film portion (5) along the unwinding path (A) against the reel (2), optionally the third roller (12) is configured to contact the reel (2) and/or to compress at least in part the unwound film portion (5) against the reel (2).

12. Packaging machine (100) comprising:

an apparatus according to any one of the preceding claims, and

a packaging station configured to receive consecutive film portions from the apparatus and to form packages using said film portions.

13. Method of unwinding a portion of a packaging film from a reel (2) using the apparatus (1) according to any one of the preceding claims 1 to 11, comprising the steps of:

- providing the apparatus (1) with the reel (2) with the first roller (4) into contact with the external surface (2a) of the reel (2),
- rotating the reel (2) around the unwinding axis (X) and unwinding a film portion through the first roller (4),
- guiding the unwound film portion (5) along the unwinding path (A),

wherein, while unwinding the film portion, the first roller (4) is moved between the plurality of positions.

14. Method according to the preceding claim, comprising the steps of:
- positioning the first roller (4) at a respective distance from the unwinding axis (X) of the support roller (3) in each one of the plurality of positions taken by the first roller (4) as the reel (2) is unwound, while maintaining contact between the first roller (4) and the external surface (2a) of the reel (2),
- moving the first roller (4) along a trajectory transverse to the first axis of rotation (Y) and/or to the unwinding axis (X) and having at least a vertical component, optionally wherein the first roller (4) is moved between the plurality of positions by gravity.

15. Method according to any one of the preceding claims 13 to 14, comprising the step of rotating the unwound film portion (5) around the first axis of rotation (X) of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°,
optionally wherein the apparatus (1) is in accordance with to any one of claims 1 to 11 when combined with claim 10, the method further comprising the step of rotating the unwound film portion (5) around the second axis of rotation (Y) of at least 90°, preferably of at least 120°, more preferably of at least 150°, even more preferably of at least 180°, even more preferably of at least 200°, and/or
wherein each one of the support roller, the first, the second and the third rollers have respective directions of rotation around respectively the unwinding axis and the first, second and third axes of rotation, and wherein the method comprises the steps of:
- rotating the support roller (3) and the first roller (4) with opposite directions of rotation,

- rotating the second roller (11) with the respective direction of rotation equal to the direction of rotation of the support roller (3),
- rotating the third roller (12) with the respective direction of rotation equal to the direction of rotation of the first roller (4).

16. Method according to any one of the preceding claims 13 to 15, wherein the step of guiding the unwound film portion (5) along the unwinding path (A) comprises the step of guiding the unwound film portion (5) against the reel (2), and/or
wherein the step of guiding the unwound film portion (5) along the unwinding path (A) comprises the steps of:

- guiding the unwound film portion along the unwinding path from a first detachment zone of the reel along a first section of an unwinding path away from the reel,
- guiding the unwound film portion along a second section of the unwinding path against the reel at a contact zone,
- detaching the unwound film portion from the reel at a second detachment zone of the reel,

wherein the first detachment zone, the second detachment zone and the contact zone are different from each other.

17. Packaging process comprising:
unwinding a portion of a packaging film (5) from a reel (2) using the method of any one of claims from 13 to 16;
feeding the unwound portion of film (5) and one or more products to be packaged to a packaging station;
at the packaging station using the unwound portion of film to form one or more packages housing one or more respective products.

18. Packaging process according to claim 17, wherein the one or more packages are formed under a controlled atmosphere or under vacuum.

19. Packaging process according to claim 17 or 18, wherein the one or more packages are in the form of bags.

20. Packaging process according to claim 19, wherein the bags are entirely formed by said one unwound portion of film (5).

21. Packaging process according to claim 17 or 18, wherein each one of the one or more packages includes a tray or support and a part of the unwound film portion applied thereto to enclose the product.

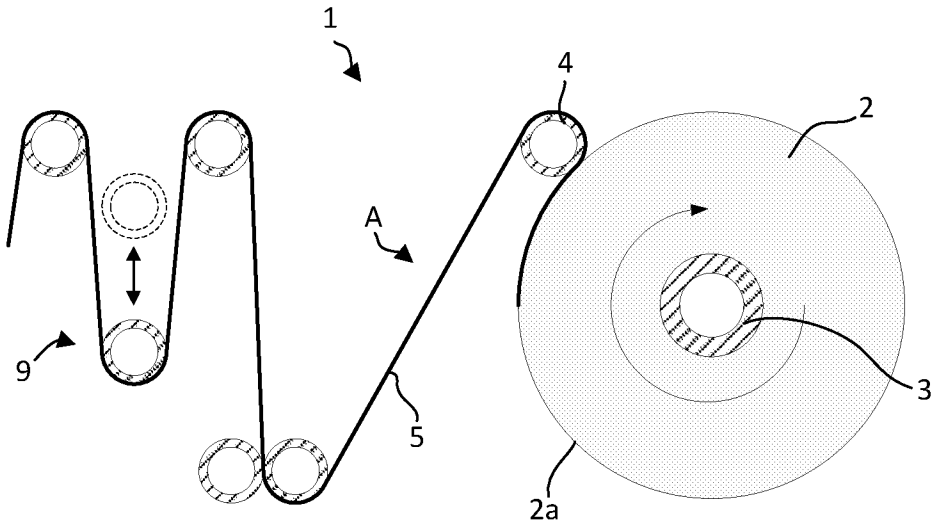

Fig. 1

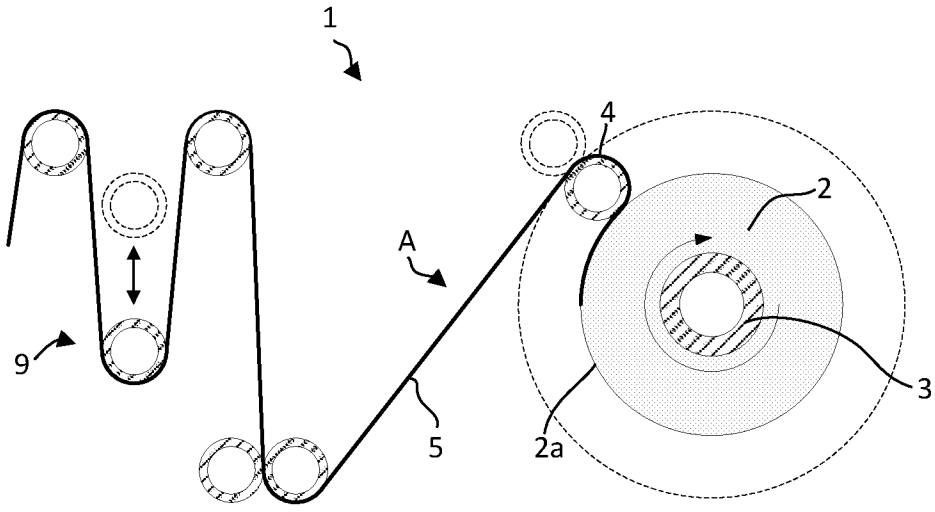

Fig. 2

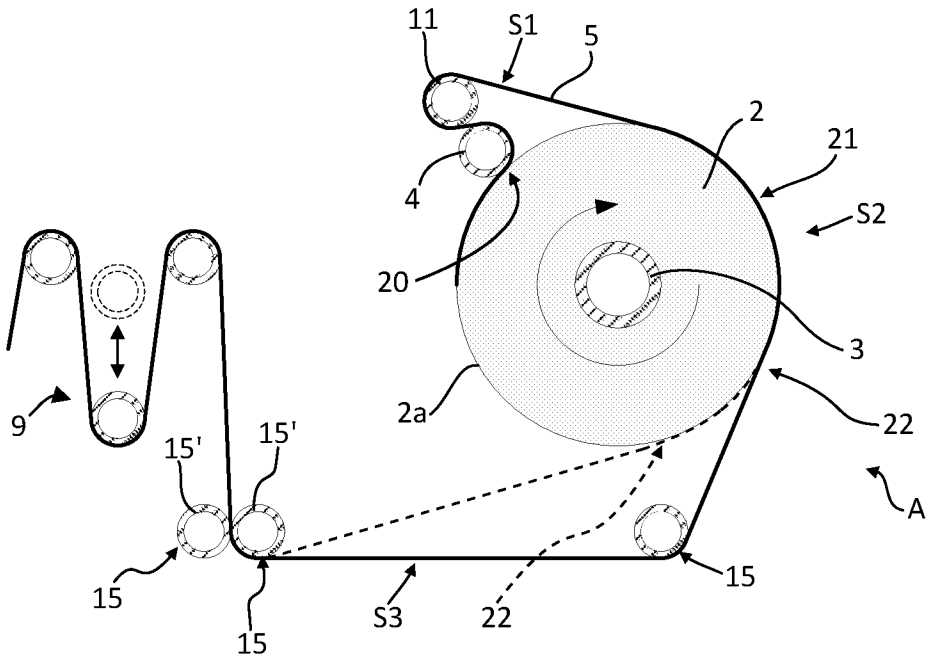
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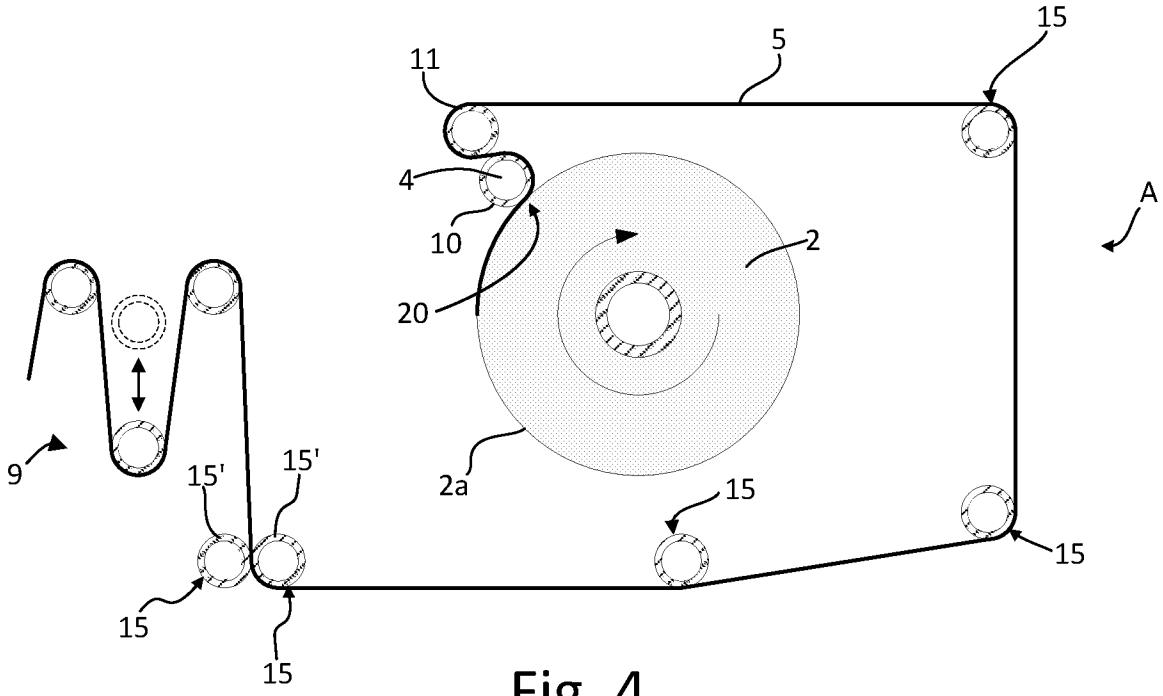
Fig. 3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15

Fig. 4

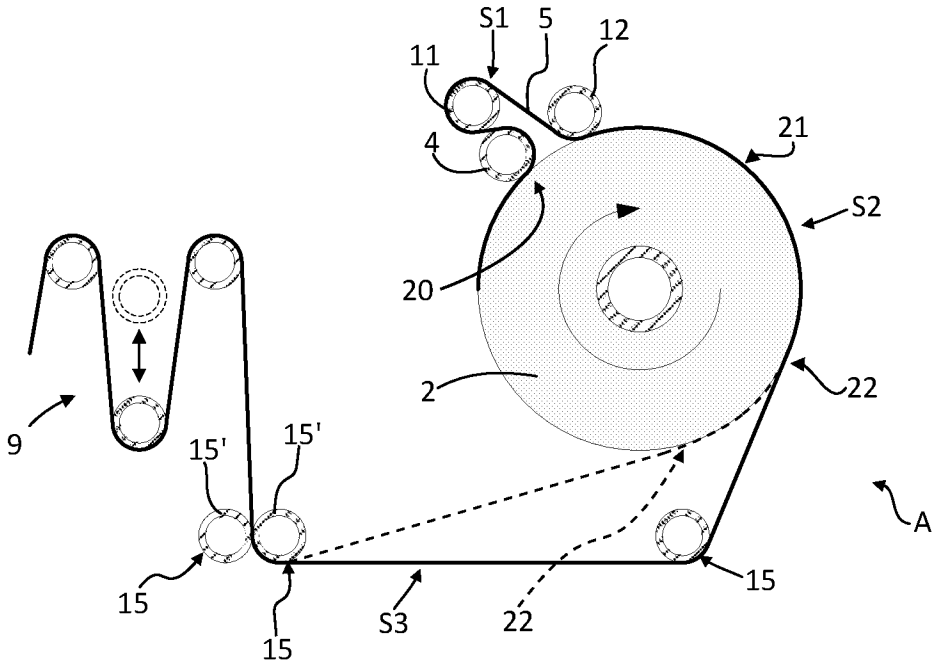

Fig. 5

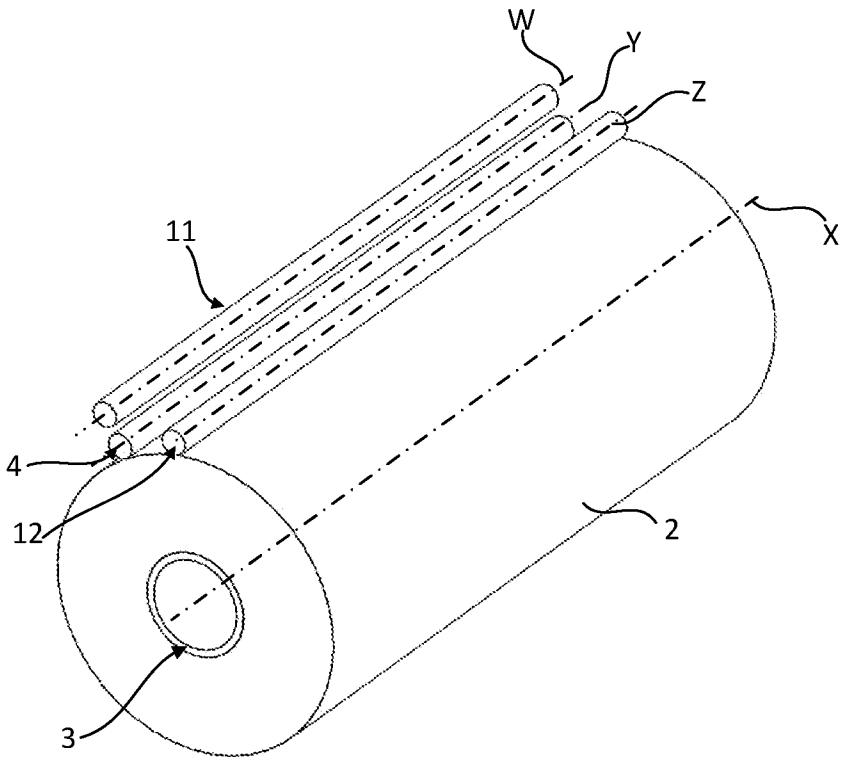

Fig. 6

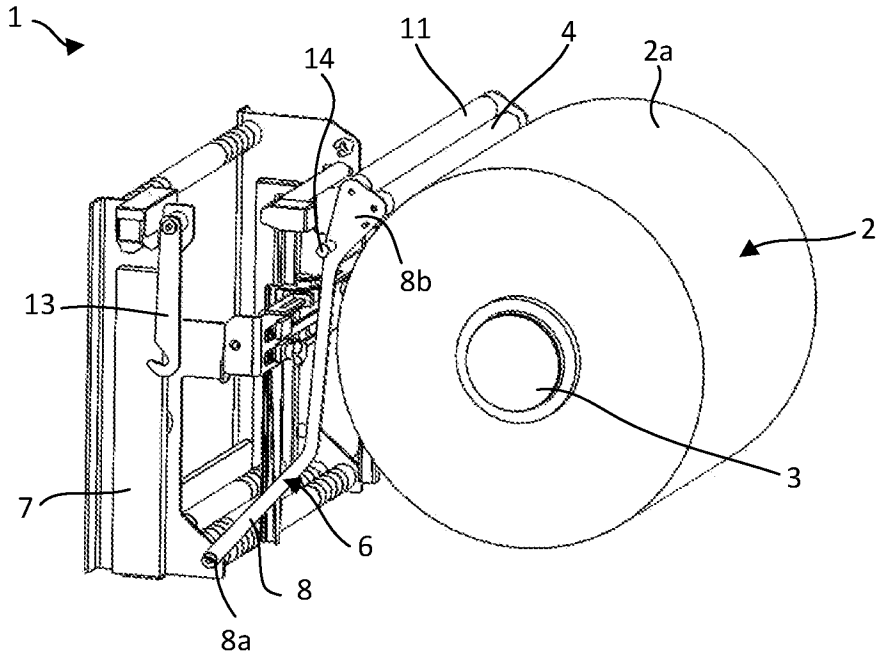

Fig. 7

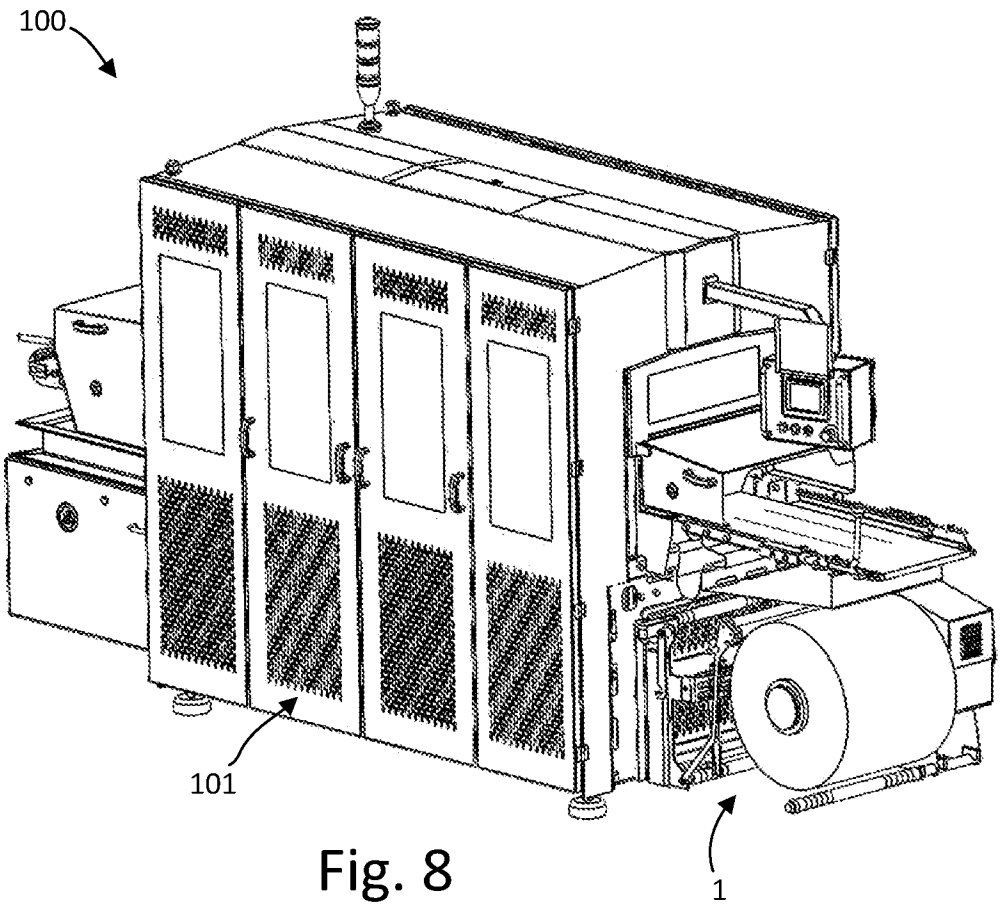

Fig. 8

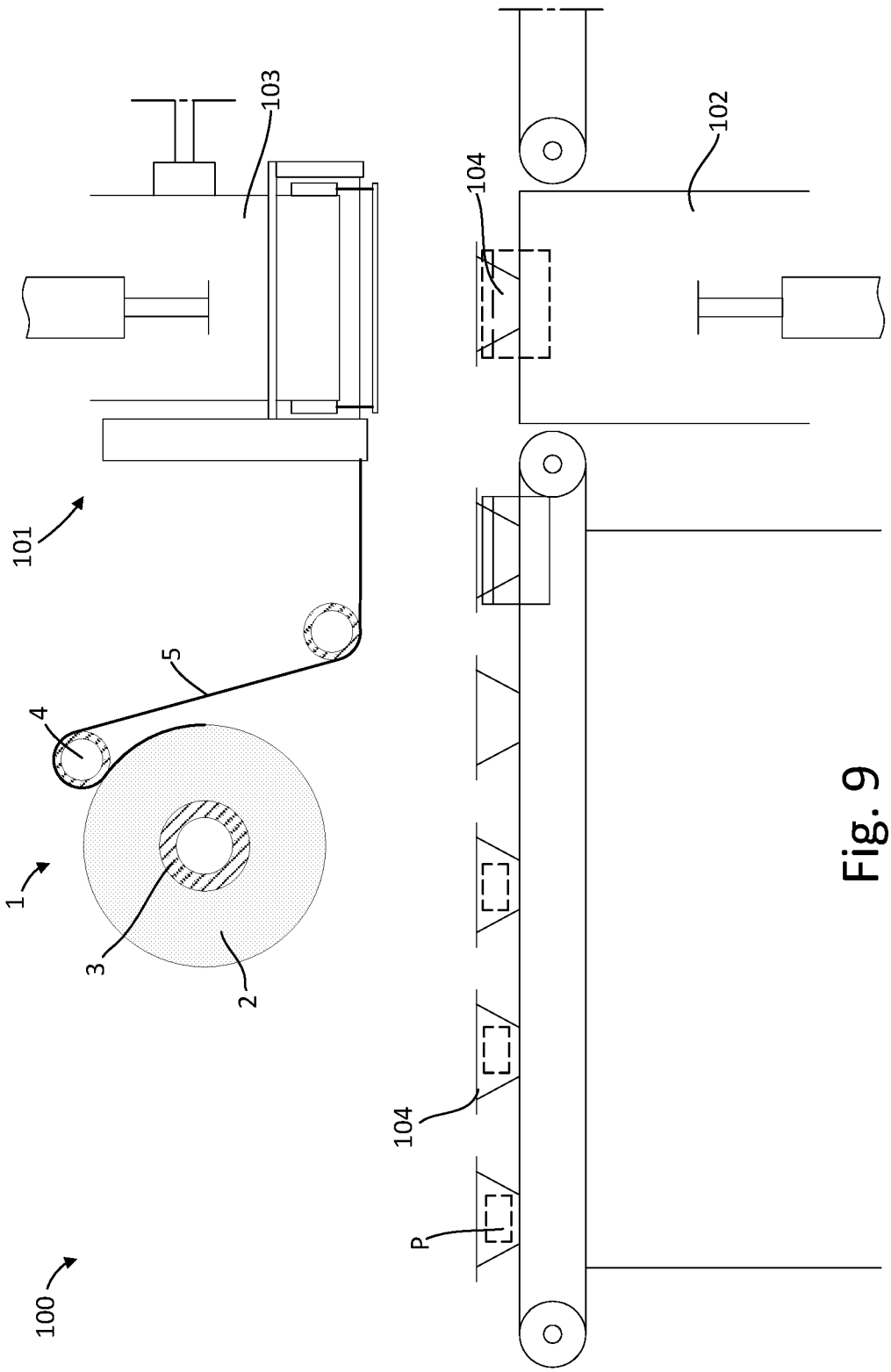

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/051813

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65B11/52 B65B43/52 B65B51/14 B29C65/78 B29C65/00
B65B7/16 B65H20/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65H B65B B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 111 152 510 A (LANGFANG ZHONGFENG MACHINERY TECH CO LTD) 15 May 2020 (2020-05-15) figure 11 abstract	1-21
A	CN 108 001 749 A (FOSHAN SOONTRUE MACHINERY EQUIPMENT CO LTD) 8 May 2018 (2018-05-08) paragraphs [0002], [0073] - [0077] figures 6,7	2
A	US 2020/391894 A1 (PALUMBO RICCARDO [IT]) 17 December 2020 (2020-12-17) paragraphs [0001], [0020] figures 1, 2	12

-/--

[x] Further documents are listed in the continuation of Box C.

[x] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
11 June 2024	26/06/2024

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Cescutti, Gabriel

3

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

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