

(19)



(11)

EP 4 183 693 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
23.10.2024 Bulletin 2024/43

(51) International Patent Classification (IPC):
B65B 1/06 (2006.01) **B65B 3/02** (2006.01)
B65B 3/06 (2006.01) **B65B 9/20** (2012.01)
B65B 41/12 (2006.01) **B65B 41/16** (2006.01)

(21) Application number: **22203486.0**

(52) Cooperative Patent Classification (CPC):
B65B 9/20; B65B 41/16; B65H 20/32;
B65H 2701/1944; B65H 2801/81

(22) Date of filing: **25.10.2022**

(54) **BUFFER UNIT FOR A PACKAGING APPARATUS, PACKAGING APPARATUS AND METHOD FOR PRODUCING SEALED PACKAGES**

PUFFEREINHEIT FÜR EINE VERPACKUNGSVORRICHTUNG, VERPACKUNGSVORRICHTUNG UND VERFAHREN ZUR HERSTELLUNG VON VERSIEGELTEN VERPACKUNGEN
UNITÉ TAMPON POUR UN APPAREIL D'EMBALLAGE, APPAREIL D'EMBALLAGE ET PROCÉDÉ DE PRODUCTION D'EMBALLAGES SCELLÉS

(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

(72) Inventors:
• **RICCO', Marco**
41123 Modena (IT)
• **BORASI, Gabriele**
41123 Modena (IT)

(30) Priority: **05.11.2021 EP 21206631**

(74) Representative: **Tetra Pak - Patent Attorneys SE**
AB Tetra Pak
Patent Department
Ruben Rausings gata
221 86 Lund (SE)

(43) Date of publication of application:
24.05.2023 Bulletin 2023/21

(73) Proprietor: **Tetra Laval Holdings & Finance S.A.**
1009 Pully (CH)

(56) References cited:
EP-A1- 3 725 689 EP-A1- 3 725 692

EP 4 183 693 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

TECHNICAL FIELD

[0001] The present invention relates to a buffer unit for a packaging apparatus for producing sealed packages from a web of packaging material and being filled with a pourable product, in particular a pourable food product.

[0002] Advantageously, the present invention also relates to a packaging apparatus for producing sealed packages from a web of packaging material and being filled with a pourable product, in particular a pourable food product.

[0003] Advantageously, the present invention also relates to a method for producing sealed packages from a web of packaging material and being filled with a pourable product, in particular a pourable food product.

BACKGROUND ART

[0004] As is known, many liquid or pourable products, such as fruit juice, UHT (ultra-high-temperature treated) milk, cream, water, wine, tomato sauce, salt, sugar, etc., are sold in packages made of a sterilized multilayer packaging material.

[0005] A typical example is the parallelepiped-shaped package for liquid or pourable food products known as Tetra Brik Aseptic (registered trademark), which is made by sealing and folding a multilayer packaging material. The multilayer packaging material comprises at least a layer of fibrous material, such as e.g. a paper or cardboard layer, and at least two layers of heat-seal plastic material, e.g. polyethylene, interposing the layer of fibrous material in between one another.

[0006] In the case of aseptic packages for long-storage products, such as UHT milk, the multilayer packaging material also comprises a layer of gas- and light-barrier material, e.g. aluminum foil, or ethylene vinyl alcohol (EVOH) film, in particular being arranged between one of the layers of the heat-seal plastic material and the layer of fibrous material.

[0007] Typically, the multilayer packaging material also comprises a further layer of heat-seal plastic material being interposed between the layer of gas- and light-barrier material and the layer of fibrous material.

[0008] Often the multilayer packaging material is provided in the form of a web of packaging material, in particular having a succession of repeated patterns, each pattern defining the pattern of one respective single package obtained at the end of the packaging process.

[0009] Packages of this sort are normally produced on a fully automatic packaging apparatus, which comprises a conveying device for advancing the web of packaging material along an advancement path, a sterilization unit for sterilizing the packaging material, a tube forming and sealing device arranged within an isolation chamber and configured to form a tube from the advancing packaging material and to longitudinally seal the tube, a filling device

for directing the pourable product into the tube and a package forming unit configured to form and to transversally seal and cut the tube for obtaining the single packages.

[0010] Typically the web of packaging material is provided in the form of a reel, which at some point of the operation of the packaging apparatus is about to exhaust. In order to avoid the need to interrupt the production, a typical packaging apparatus typically comprises a splicing unit for splicing a new web of packaging material to the web of packaging material in use. This, however, requires the portion of the web of packaging material in use, which will be spliced together with the new web of packaging material, to be in a fixed and initially non-moving position.

[0011] Therefore, a typical packaging apparatus also comprises a buffer unit arranged upstream of the tube forming and sealing device and configured to buffer the web of packaging material. Thus, prior to the need of splicing the new web of packaging material to the web of packaging material in use, the quantity of the web of packaging material present within the buffer unit (e.g. measured in meters and/or in seconds of the web of packaging material present within the buffer unit) is increased such that during the activation of the splicing unit, the portions of the web of packaging material being arranged upstream of the buffer unit do not advance, while the portions of the web of packaging material arranged downstream of the buffer unit advance as being fed by the buffer unit.

[0012] The known buffer units comprise an infeed roller device, an outfeed roller device and a first group of rollers and a second group of rollers. Thereby, the distance between the second group of rollers and the first group of rollers is variable so as to control the quantity of the web of packaging material being present within the buffer unit. When there is the need to increase the quantity of the web of packaging material, one increases the infeed speed with respect to the outfeed speed and increases the relative distance between the first group of rollers and the second group of rollers, while when there is the need to reduce the quantity of the web of packaging material within the buffer unit, one reduces the infeed speed with respect to the outfeed speed and reduces the relative distance between the first group of rollers and the second group of rollers.

[0013] During a normal operation condition, the relative distance between the first group of rollers and the second group of rollers is kept substantially constant.

[0014] Even though such buffer units operate satisfactorily well, a desire is felt in the sector to further improve the known packaging apparatuses.

[0015] EP3725689A1 discloses a tensioning device comprising at least one tensioning assembly having at least a first drive roller, a second drive roller, a first drive motor connected to the first drive roller and configured to actuate rotation of the first drive roller and a second drive motor connected to the second drive roller and con-

figured to actuate rotation of the second drive roller around the second rotation axis. A control unit is configured to control the first drive motor and the second drive motor such that a free loop of a web of packaging material expands and/or advances, in use, between the first drive roller and the second drive roller.

[0016] EP3725692A1 discloses tensioning device comprising a main drive roller rotatable around a main rotation axis and a main drive motor configured to actuate rotation of the main drive roller around the main rotation axis. The control unit is configured to control the main drive motor such that an angular speed and/or angular acceleration of the main drive roller is cyclically varied such to control the tension of a tube.

DISCLOSURE OF INVENTION

[0017] It is therefore an object of the present invention to provide an improved buffer unit for a packaging apparatus for producing packages formed from a web of packaging material and being filled with a pourable product.

[0018] It is a further object of the present invention to provide an improved packaging apparatus for producing packages formed from a web of packaging material and being filled with a pourable product.

[0019] It is another object of the present invention to provide an improved method for producing packages formed from a web of packaging material and being filled with a pourable product.

[0020] According to the present invention, there is provided a buffer unit as claimed in claim 1.

[0021] Further advantageous embodiments of the buffer unit according to the invention are specified in the respective dependent claims.

[0022] Advantageously and according to the present invention, there is provided a packaging apparatus according to claim 10.

[0023] Further advantageous embodiments of the packaging apparatus according to the invention are specified in the claims being directly or indirectly dependent on claim 10.

[0024] Advantageously and according to the present invention, there is provided a method according to claim 12.

[0025] Further advantageous embodiments of the method according to the invention are specified in the claims being directly or indirectly dependent on claim 12.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a schematic view of a packaging apparatus having a buffer unit according to the present invention, with parts removed for clarity;
Figure 2 is an enlarged schematic and perspective

view of details of the packaging apparatus of Figure 1, with parts removed for clarity;

Figure 3 is a schematic side view of further details of the packaging apparatus of Figure 1 and with the buffer unit being in a first configuration, with parts removed for clarity;

Figure 4 is a schematic side view of further details of the packaging apparatus of Figure 1 and with the buffer unit being in a second configuration and having a first load level, with parts removed for clarity; and

Figure 5 is a schematic side view of further details of the packaging apparatus of Figure 1 and with the buffer unit being in the second configuration and having a second load level, with parts removed for clarity.

BEST MODES FOR CARRYING OUT THE INVENTION

[0027] Number 1 indicates as a whole a packaging apparatus, in particular an automatic packaging apparatus, for (continuously) producing packages 2 filled with a pourable product, in particular a pourable food product, such as milk, fruit juice, wine, water, salt, sugar, and similar. Packaging apparatus 1 is configured to produce packages 2 from a web of packaging material 3, in particular by forming, filling and sealing the web of packaging material 3.

[0028] In more detail, web of packaging material 3 may have a multilayer structure (not shown) and may comprise at least one layer of fibrous material, such as e.g. a paper or cardboard layer, and at least two layers of heat-seal plastic material, e.g. polyethylene, interposing the layer of fibrous material in between one another. One of these two layers of heat-seal plastic material may define an inner face of package 2 eventually contacting the pourable product.

[0029] Preferably, web of packaging material 3 may also comprise a layer of gas- and light-barrier material, e.g. aluminum foil or ethylene vinyl alcohol (EVOH) film, in particular being arranged between one of the layers of the heat-seal plastic material and the layer of fibrous material. Preferentially, web of packaging material 3 may also comprise a further layer of heat-seal plastic material being interposed between the layer of gas- and light-barrier material and the layer of fibrous material.

[0030] According to the embodiment disclosed, web of packaging material 3 comprises a succession of patterns, in particular each pattern being associated to one respective package 2 once the respective package 2 has been formed.

[0031] With particular reference to Figures 1 and 2, packaging apparatus 1 comprises at least:

- a conveying device 4 configured to advance web of packaging material 3 along a web advancement path P;
- a buffer unit 5 configured to buffer web of packaging material 3;

- a tube forming and sealing device 6 configured to form a tube 7 from the, in use, advancing web of packaging material 3 and to longitudinally seal tube 7;
- a filling device 8 configured to fill tube 7 with the pourable product; and
- a package forming unit (not shown and known as such) configured to form, to transversally seal and, preferably to transversally cut, tube 7, for forming packages 2.

[0032] Preferentially, operation of buffer unit 5 may be controlled in dependence of operation of conveying device 4.

[0033] In more detail, tube forming and sealing device 6 may be arranged downstream of buffer unit 5 along web advancement path P.

[0034] Preferentially, conveying device 4 may also be configured to advance tube 7 along a tube advancement path Q. In more detail, conveying device 4 may be configured to advance tube 7 and any intermediate of tube 7, in a manner known as such, along tube advancement path Q. In particular, with the wording intermediates of tube 7 any configuration of web of packaging material 3 is meant prior to obtaining the tube structure and after folding of web of packaging material 3 by tube forming and sealing device 6 has started. In other words, the intermediates of tube 7 are a result of a gradual folding of web of packaging material 3 so as to obtain tube 7, in particular by overlapping lateral edges of web of packaging material 3 with one another.

[0035] Preferentially, packaging apparatus 1 may also comprise a control unit configured to control operation of packaging apparatus 1.

[0036] Advantageously, packaging apparatus 1 may also comprise an isolation chamber (not shown and known as such) having an inner environment, in particular a sterile inner environment. In particular, the isolation chamber separates the inner environment from an (hostile) outer environment.

[0037] Preferentially, the isolation chamber may have a vertical orientation.

[0038] Preferentially, tube forming and sealing device 6 may be at least partially arranged within the isolation chamber and/or the inner environment and configured to form and longitudinally seal tube 7 within inner environment.

[0039] According to some preferred non-limiting embodiments, packaging apparatus 2 may also comprise a splicing unit (not shown and known as such) configured to splice a new web of packaging material to web of packaging material 3 in use.

[0040] In particular, the splicing unit may be arranged upstream of buffer unit 5 along web advancement path P.

[0041] Preferentially, packaging apparatus 1 may also comprise a magazine unit 9 having at least a first support for carrying a reel 10 of web of packaging material 3.

Even more preferentially, magazine unit 9 may also comprise a second support for carrying another reel 10 of web of packaging material 3.

[0042] More specifically, one of the first support and the second support may provide for web of packaging material 3 in use and the other one of the first support and the second support may provide for the new web of packaging material 3. In use, the roles of the first support and the second support alternate. For example, at first the first support carries reel 10 of web of packaging material 3 in use, while the second support carries reel 10 of the new of packaging material 3. After the splicing, the second support carries reel 10 of web of packaging material 3 in use, while the first support carries another reel 10 of the new of packaging material 3.

[0043] According to some preferred non-limiting embodiments, packaging apparatus 1 may also comprise a sterilizing unit (not shown and known as such) configured to sterilize, in particular by means of chemical and/or physical sterilization, the, in use, advancing web of packaging material 3. Preferentially, the sterilization station may be arranged upstream of tube forming and sealing device 6 and downstream of buffer unit 5 along web advancement path P.

[0044] Preferentially, the package forming unit may be configured to shape and transversally seal and in particular cut, in use, tube 7 during advancement of tube 7 along at least a portion of tube advancement path Q.

[0045] With particular reference to Figure 1, tube forming and sealing device 6 may comprise a tube forming unit 13 at least partially, preferentially fully, arranged within the isolation chamber, in particular within the inner environment, and configured to gradually fold, in use, web of packaging material 3 into tube 7, in particular by (gradually) overlapping the lateral edges of web of packaging material 3 with one another. Preferentially, tube forming unit 13 may extend along a longitudinal axis, in particular having a vertical orientation.

[0046] Preferentially, tube forming and sealing device 6 may also comprise a sealing unit being at least partially arranged within the isolation chamber and/or the inner environment and configured to longitudinally seal tube 7.

[0047] Furthermore, the sealing unit may comprise a sealing head (not shown) arranged within the isolation chamber and being configured to transfer thermal energy to tube 7 for longitudinally sealing tube 7. In particular, the sealing head can be of any type, e.g. of the kind operating by means of induction heating and/or by a stream of a heated gas and/or by means of ultrasound and/or by laser heating and/or by any other means.

[0048] Preferentially, the sealing unit may also comprise a pressing assembly adapted to exert a mechanical force on tube 7 so as to ensure the longitudinal sealing of tube 7.

[0049] With particular reference to Figure 1, filling device 8 may comprise a filling pipe 14 for directing the pourable product, in use, into tube 7. In particular, filling pipe 14 may be in fluid connection or is controllable to

be in fluid connection with a pourable product storage tank (not shown and known as such), which is adapted to store/provide for the pourable product, in particular the pourable food product, to be packaged.

[0050] Preferentially, filling pipe 14 may, in use, be at least partially placed within tube 7.

[0051] According to some preferred non-limiting embodiments, the package forming unit may comprise a plurality of pairs of at least one respective operative assembly (known as such and not shown) and at least one counter-operative assembly (known as such and not shown); and

- a conveying unit (known as such and not shown) adapted to advance the respective operative assemblies and the respective counter-operative assemblies of the pairs along respective conveying paths.

[0052] In more detail, each operative assembly may be configured to cooperate, in use, with the respective counter-operative assembly of the respective pair for forming one respective package 2 from tube 7. In particular, each operative assembly and the respective counter-operative assembly may be configured to shape, to transversally seal and, preferably also to transversally cut, tube 7 for forming packages 2.

[0053] In further detail, each operative assembly and the respective counter-operative assembly may be configured to cooperate with one another for forming a respective package 2 from tube 7 when advancing along a respective operative portion of the respective conveying path. In particular, during advancement along the respective operative portion each operative assembly and the respective counter-operative assembly may advance parallel to and in the same direction as tube 7.

[0054] With particular reference to Figures 1 to 5, buffer unit 5 comprises:

- an infeed roller device 20 configured to feed web of packaging material 3 into buffer unit 5; and
- an outfeed roller device 21 configured to direct web of packaging material 3 out of buffer unit 5.

[0055] In particular, the portion of web of packaging material 3 being present within buffer unit 5 may extend between infeed roller device 20 and outfeed roller device 21.

[0056] In particular, buffer unit 5 may lack any further roller devices interposed between infeed roller device 20 and outfeed roller device 21 along web advancement path P. In other words, there are no further roller devices interposed between infeed roller device 20 and outfeed roller device 21 along web advancement path P.

[0057] Preferentially, web of packaging material 3 does not interact with any other kind of roller devices, and respective rollers, in addition to infeed roller device 20 and outfeed roller device 21 when being within buffer unit 5.

[0058] Moreover, the loading of buffer unit 5 can be measured as the quantity of web of packaging material 3 extending between infeed roller device 20 and outfeed roller device 21. Thereby, the quantity of web of packaging material 3 within buffer unit 5 can be expressed in terms of meters and/or seconds. In more detail, when expressing the quantity of web of packaging material 3 within in meters, one intends the meters of web of packaging material 3 extending between infeed roller device 20 and outfeed roller device 21, and along a longitudinal axis of web of packaging material 3. In addition or alternatively, when expressing the quantity in seconds, one indicates the quantity of web of packaging material 3 extending between infeed roller device 20 and outfeed roller device 21 and the time it is possible to feed web of packaging material 3 out of buffering unit 5 without the need to introduce new web of packaging material 3 into buffer unit 5.

[0059] Preferentially, buffer unit 5 is controllable in:

- an accumulation configuration, in which web of packaging material 3 is accumulated within buffer unit 5, in particular between infeed roller device 20 and outfeed roller device 21 (i.e. the quantity of web of packaging material 3 within buffer unit 5 is increased);
- a buffering configuration, in which the quantity of web of packaging material 3 present within buffer unit 5, in particular between infeed roller device 20 and outfeed roller device 21, is kept substantially constant (i.e. the quantity of web of packaging material 3 within buffer unit 5 fluctuates around an average quantity); and
- a decumulation configuration, in which web of packaging material 3 present within buffer unit 5, in particular between infeed roller device 20 and outfeed roller device 21, is decumulated (i.e. the quantity of web of packaging material 3 within buffer unit 5 is reduced).

[0060] Preferentially, buffer unit 5 is controlled, in use, in particular by means of the control unit, in the buffering configuration during a normal production of packaging apparatus 1 for forming packages 2. When it becomes necessary (e.g. because one needs to prepare for activation of the splicing unit) to buffer web of packaging material 3 within buffer unit 5, in particular between infeed roller device 20 and outfeed roller device 21, buffer unit 5 is controlled, in use, in particular by means of the control unit, in the accumulation configuration. Afterwards (e.g. after completion of a splicing of web of packaging material 3 in use with the new web of packaging material 3), buffer unit 5 is controlled, in use, in particular by means of the control unit, in the decumulation configuration. Then, buffer unit 5 is controlled, in particular by the control unit, in the buffering configuration again.

[0061] Moreover, buffer unit 5 also comprises an accumulation housing 22 having an accumulation space 23 configured to randomly receive (see Figures 4 and 5)

web of packaging material 3 while buffer unit 5 is controlled, in use, in the accumulation configuration.

[0062] In particular, accumulation housing 22 may delimit accumulation space 23.

[0063] More specifically and with particular reference to Figures 4 and 5, buffer unit 5, in particular accumulation housing 22, may be configured such that while buffer unit 5 is controlled in the accumulation configuration, web of packaging material 3 being present within buffer unit 5 randomly, in particular freely and randomly, falls into accumulation housing 22, i.e. web of packaging material 3 being present within buffer unit 5 may only interact with infeed roller device 20, outfeed roller device 21 and accumulation housing 22 and web of packaging material 3 does not take a defined and ordered position.

[0064] Additionally, in use, in dependence of the loading of buffer unit 5 (i.e. the quantity of web of packaging material 3 present within accumulation housing 22 or, in other words, the meters of web of packaging material 3 present within accumulation space 23) the shape of web of packaging material 3 continuously changes while buffer unit 5 is operated in the accumulation configuration. For example, web of packaging material 3 present within accumulation housing 22, in particular accumulation space 23, may take a form as the one shown in Figures 4 and 5, but not necessarily. For example, if web of packaging material 3 takes the form as the one shown in Figures 4 or 5, such a specific configuration would typically persist only for a short time as new web of packaging material 3 enters into accumulation space 23.

[0065] It should be noted that preferentially the term "randomly" indicates that the shape of web of packaging material 3 is not determined and may vary.

[0066] In further detail, web of packaging material 3 randomly, in particular randomly and freely, extends between infeed roller device 20 and outfeed roller device 21 while buffer unit 5 is controlled in the accumulation configuration.

[0067] In particular, as buffer unit 5 lacks any further roller device and/or roller between infeed roller device 20 and outfeed roller device 21, web of packaging material 3 present within buffer unit 5 is freely connected between infeed roller device 20 and outfeed roller device 21.

[0068] Moreover, while buffer unit 5 is controlled in the accumulation configuration, the quantity of web of packaging material 3 present within buffer unit 5 can be modified, in particular until accumulation space 23 is fully occupied and/or a maximum load is obtained.

[0069] In more detail and with particular reference to Figure 3, buffer unit 5 is configured such that web of packaging material 3 is arranged in a free loop 24 within buffer unit 5, in particular between infeed roller device 20 and outfeed roller device 21, while buffer unit 5 is controlled in the buffering configuration.

[0070] In even more detail, buffer unit 5 is configured such that while, in use, buffer unit 5 is controlled in the buffering configuration free loop 24 present within buffer unit 5 fluctuates around an average shape, e.g. meas-

ured in meters and/or in dependence of the position of an apex 25 of free loop 24.

[0071] It should be noted that free loop 24 may develop as there are no further elements (such as, for example, rollers), which may define the shape of web of packaging material 3 extending within buffer unit 5, in particular between infeed roller device 20 and outfeed roller device 21, and in particular also because of the acting gravitational force.

[0072] Advantageously, buffer unit 5 may be configured such that while buffer unit 5 is controlled in the decumulation configuration, the randomly, in particular the freely and randomly, arranged web of packaging material 3 is decumulated out of accumulation space 23, and in particular out of buffer unit 5. Preferentially, buffer unit 5 is controlled back from the decumulation configuration to the buffering configuration once web of packaging material 3 present within buffer unit 5 takes the form of a free loop 24 again, and in particular having the desired quantity of web of packaging material 3.

[0073] With particular reference to Figures 2 to 5, accumulation housing 22 may comprise a main wall 26, a plurality of lateral delimiting walls 27 transversal, in particular perpendicular, to main wall 26 and a main opening 28 through which web of packaging material 3 enters into accumulation space 23.

[0074] In particular, main wall 26 may be opposite to main opening 28.

[0075] More specifically, main wall 26 may define a bottom wall of accumulation housing 22.

[0076] Preferentially, main opening 28 may be delimited by respective lateral delimiting walls 27.

[0077] In particular, main opening 28 may be arranged at an upper portion of accumulation housing 22.

[0078] In use, when buffer unit 5 is controlled in the accumulation configuration, web of packaging material 3 has a shape of a free loop until web of packaging material 3 starts to contact main wall 26. Then, web of packaging material 3 becomes randomly distributed within accumulation housing 22, in particular accumulation space 23.

[0079] With particular reference to Figures 1 to 5, infeed roller device 20 may comprise a drive roller 32 and one or more counter rollers 33, in the specific case shown two, in particular for interposing web of packaging material 3 between drive roller 32 and the one or more counter rollers 33.

[0080] Moreover, infeed roller device 20 may also comprise an actuator 34, in particular a motor, even more particular an electrical motor, configured to actuate a rotation of drive roller 32. In particular, actuator 34 may be configured to control an angular speed of drive roller 32 such to at least partially control an infeed speed of web of packaging material 3 into accumulation housing 22, in particular accumulation space 23.

[0081] Reverting again to Figures 1 to 5, outfeed roller device 21 may also comprise a main roller 35 and one or more counter rollers 36, in the specific case shown

two, in particular so as to interpose, in use, web of packaging material 3 between main roller 35 and the one or more counter rollers 36.

[0082] Preferentially, outfeed roller device 21 may also comprise a brake 37 configured to decelerate main roller 35, in particular so as to control the tension of web of packaging material 3, in particular downstream of outfeed roller device 21 along web advancement path P.

[0083] In particular, web of packaging material 3 may freely extend between drive roller 32 and main roller 35.

[0084] According to some preferred non-limiting embodiments, buffer unit 5 and/or conveying device 4 may be configured such that:

- an infeed speed of web of packaging material 3 into buffer unit 5 substantially corresponds to an outfeed speed of web of packaging material 3 out of buffer unit 5, when buffer unit 5 is controlled in the buffering configuration; and/or
- the infeed speed of web of packaging material 3 into buffer unit 5 is larger than the outfeed speed of web of packaging material 3 out of buffer unit 5, when buffer unit 5 is controlled in the accumulation configuration; and/or
- the infeed speed of web of packaging material 3 into buffer unit 5 is smaller than the outfeed speed of web of packaging material 3, in particular this may include the possibility of keeping the infeed speed of web of packaging material 3 at 0 m/s, out of buffer unit 5, when buffer unit 5 is controlled in the decumulation configuration.

[0085] In more detail, infeed roller device 20, in particular drive roller 32, is configured such to at least partially control the infeed speed of web of packaging material 3 into buffer unit 5 such that:

- the infeed speed is larger than the outfeed speed while the buffer unit 5 is, in use, controlled in the accumulation configuration; and/or
- the infeed speed is smaller than the outfeed speed, in particular including also the possibility of keeping the infeed speed at 0 m/s, while the buffer unit 5 is, in use, controlled in the decumulation configuration; and/or
- the infeed speed substantially corresponds to the outfeed speed while the buffer unit 5 is, in use, controlled in the buffering configuration.

[0086] According to some preferred non-limiting embodiments, conveying device 4 may comprise a roller 38 arranged upstream of infeed roller device 20 along web advancement path P. In particular, roller 38 may be arranged such that web of packaging material 3 has an auxiliary free loop 39 between roller 38 and infeed roller device 20.

[0087] In use, packaging apparatus 1 forms packages 2 filled with the pourable product. In particular, packaging

apparatus 1 forms packages 2 from tube 7 formed from web of packaging material 3, tube 7 being continuously filled with the pourable product.

[0088] In more detail, operation of packaging apparatus 1 (in other words, the formation of packages 2) comprises at least the steps of:

- advancing web of packaging material 3 along web advancement path P, in particular by conveying device 4;
- forming tube 7, during which web of packaging material 3 is formed into tube 7, in particular by tube forming and sealing device 6, even more particular by tube forming unit 13;
- longitudinally sealing tube 7, during which tube 7 is longitudinally sealed, in particular by tube forming and sealing device 6, even more particular by the sealing unit;
- filling tube 7, during which the pourable product is filled into tube 7, in particular by filling device 8, even more particular by filling pipe 14.

[0089] Preferentially, the formation of packages 2 also comprises a further step of advancing, during which tube 7 is advanced, in particular by conveying device 4, along tube advancement path Q.

[0090] According to some preferred non-limiting embodiments, the formation of packages 2 also comprises a step of forming, during which packages 2 are formed from tube 7, in particular by shaping, transversally sealing and in particular transversally cutting tube 7. Preferentially, during the step of forming, packages 2 are formed by operation of the package forming unit.

[0091] Preferentially, operation of packaging apparatus 1 may also comprise the step of sterilizing, during which web of packaging material 3 is sterilized by the sterilization unit.

[0092] According to some preferred non-limiting embodiments, operation of packaging apparatus 1 may also comprise a step of splicing, during which a web of packaging material 3 in use is spliced with a new web of packaging material 3.

[0093] Operation of packaging apparatus 1 may also comprise a step of controlling during which the buffer unit 5 is controlled in one of the accumulation configuration, the buffering configuration and the decumulation configuration.

[0094] In more detail, a step of accumulating is executed while the buffer unit 5 is controlled in the accumulation configuration and during which web of packaging material 3 is randomly accumulated within buffer unit 5, in particular within accumulation space 23 of accumulation housing 22.

[0095] Moreover, a step of normal buffering is executed while the buffer unit 5 is controlled in the buffering configuration and during which free loop 24 of web of packaging material 3 is maintained within buffer unit 5, in particular between inlet roller device 20 and outlet roller

device 21.

[0096] Additionally, a decumulation step is executed when the buffer unit 5 is controlled in the decumulation configuration and during which web of packaging material 3 is decumulated from buffer unit 5, in particular from accumulation space 23 of accumulation housing 22.

[0097] In even more detail, during the step of accumulating the infeed speed of web of packaging material 3 into buffer unit 5 may be larger than the outfeed speed of web of packaging material 3 out of buffer unit 5.

[0098] Moreover, during the step of decumulating, the infeed speed of web of packaging material 3 into buffer unit 5 may be smaller than the outfeed speed of web of packaging material 3 out of buffer unit 5. This may include the possibility of keeping the infeed speed of web of packaging material 3 at least for some time at 0 m/s.

[0099] Additionally, during the step of normal buffering, the infeed speed of web of packaging material 3 into buffer unit 5 may substantially correspond to the outfeed speed of web of packaging material 3 out of buffer unit 5.

[0100] Preferentially, the step of accumulating may be executed prior to the step of splicing.

[0101] Moreover the step of decumulating may be executed during the step of splicing.

[0102] In further detail, the step of accumulating may be executed after the step of normal buffering. After termination of the step of accumulating, the step of decumulating is executed and then the step of normal buffering is executed again.

[0103] The advantages of buffer unit 5 and/or packaging apparatus 1 and the method according to the present invention will be clear from the foregoing description.

[0104] In particular, buffer unit 5 comes along with a simple design. This because there is neither a first group of rollers nor a second group of rollers as in the prior art buffer units. Accordingly, one also avoids relying on means for varying the relative distance between the first group of rollers and the second group of rollers.

[0105] A further advantage resides in that web of packaging material 3 when passing through buffer unit 5 is not in contact with any roller besides the ones of infeed roller device 20 and outfeed roller device 21. This also reduces the stresses acting on web of packaging material 3.

[0106] Clearly, changes may be made to buffer unit 5 and/or packaging apparatus 1 and/or the method as described herein without, however, departing from the scope of protection as defined in the accompanying claims.

Claims

1. A buffer unit (5) for a packaging apparatus (1) for forming packages (2) from a web of packaging material (3) and being filled with a pourable product;

the buffer unit (5) being configured to buffer the

web of packaging material (3) and comprises:

- an infeed roller device (20) configured to feed the web of packaging material (3) into the buffer unit (5);
- an outfeed roller device (21) configured to direct the web of packaging material (3) out of the buffer unit (5) ;

characterized in that the buffer unit (5) further comprises:

- an accumulation housing (22) having an accumulation space (23) configured to randomly receive the web of packaging material (3);

wherein the buffer unit (5) is controllable in an accumulation configuration, in which the web of packaging material (3) is randomly accumulated within the buffer unit (5) ;

wherein the accumulation housing (22) comprises a main wall (26), a plurality of lateral delimiting walls (27) transversal to the main wall (26) and a main opening (28) through which the web of packaging material (3) enters into the accumulation space (23);

wherein when, in use, the buffer unit (5) is controlled in the accumulation configuration the web of packaging material (3) has a shape of a free loop until the web of packaging material (3) starts to contact the main wall (26), then the web of packaging material (3) becomes randomly distributed within the accumulation housing (22).

2. Buffer unit according to claim 1, and also being controllable in a buffering configuration; wherein the buffer unit (5) is configured such that the web of packaging material (3) is arranged in a free loop (24) between the infeed roller device (20) and the outfeed roller device (21) while the buffer unit (5) is controlled in the buffering configuration.

3. Buffer unit according to claim 1 or 2, wherein the buffer unit (5) is also controllable in a decumulation configuration; wherein the buffer unit (5) is configured such that while the buffer unit (5) is controlled in the decumulation configuration the randomly arranged web of packaging material (3) is decumulated out of the accumulation space (23) .

4. Buffer unit according to any one of the preceding claims, wherein the web of packaging material (3) freely and randomly extends between the infeed roller device (20) and the outfeed roller device (21) while the buffer unit (5) is controlled in the accumulation

configuration.

5. Buffer unit according to any one of the preceding claims, wherein the main wall (26) is opposite to the main opening (28).
6. Buffer unit according to any one of the preceding claims, wherein the infeed roller device (20) comprises a drive roller (32) and at least one counter roller (33).
7. Buffer unit according to any one of the preceding claims, wherein the outfeed roller device (21) comprises a main roller (35) and at least one counter roller (36).
8. Buffer unit according to claim 6 and 7, wherein the web of packaging material (3) freely extends between the drive roller (32) and the main roller (35).
9. Buffer unit according to any one of the preceding claims, wherein the infeed roller device (20) is configured such to keep an infeed speed of the web of packaging material (3) into the buffer unit (5) to be larger than an outfeed speed of the web of packaging material (3) from the buffer unit (5) while the buffer unit (5) is, in use, controlled in the accumulation configuration.
10. A packaging apparatus (1) for forming packages (2) from a web of packaging material (3) and being filled with a pourable product; the packaging apparatus (1) comprises:
- a conveying device (4) for advancing the web of packaging material (3) along a web advancement path (P);
 - a buffer unit (5) according to any one of the preceding claims;
 - a tube forming and sealing device (6) configured to form and longitudinally seal a tube (7) from the web of packaging material (3) and being arranged upstream of the buffer unit (5) along the web advancement path (P);
 - a filling device (8) configured to direct, in use, the pourable product into the tube (7); and
 - a package forming unit configured to at least form and to transversally seal the, in use, advancing tube (7) for forming the packages (2).
11. Packaging apparatus according to claim 10, and further comprising a splicing unit configured to splice a new web of packaging material (3) to the web of packaging material (3) in use; wherein the buffer unit (5) is configured to be controlled in the accumulation configuration prior to an activation of the splicing unit.

12. Method for forming packages (2) from a web of packaging material (3) and being filled with a pourable product comprising at least the steps of:

- advancing the web of packaging material (3) along a web advancement path (P);
- forming a tube (7) from the web of packaging material (3);
- longitudinally sealing the tube (7);
- filling the tube (7) with the pourable product; and
- accumulating the web of packaging material (3), during which a buffer unit (5) accumulates the web of packaging material (3); wherein the buffer unit (5) comprises:
 - an infeed roller device (20) configured to feed the web of packaging material (3) into the buffer unit (5);
 - an outfeed roller device (21) configured to direct the web of packaging material (3) out of the buffer unit (5);

characterized in that the buffer unit (5) further comprises:

- an accumulation housing (22) having an accumulation space (23) configured to randomly receive the web of packaging material (3);

wherein, during the step of accumulating, the buffer unit (5) randomly accumulates the web of packaging material (3) within the accumulation space (23);

wherein the accumulation housing (22) comprises a main wall (26), a plurality of lateral delimiting walls (27) transversal to the main wall (26) and a main opening (28) through which the web of packaging material (3) enters into the accumulation space (23);

wherein in use, when the buffer unit (5) is controlled in the accumulation configuration the web of packaging material (3) has a shape of a free loop until the web of packaging material (3) starts to contact the main wall (26), then the web of packaging material (3) becomes randomly distributed within the accumulation housing (22).

13. Method according to claim 12, and further comprising a step of controlling the buffer unit (5) in one of:

- an accumulation configuration for accumulating the web of packaging material (3) within the buffer unit (5);
- a buffering configuration at which the buffer unit (5) keeps the quantity of the web of pack-

aging material (3) within the buffer unit (5) substantially constant; and

- a decumulation configuration during which the web of packaging material (3) present within the buffer unit (5) is decumulated;

wherein the step of accumulating is executed while the buffer unit (5) is controlled in the accumulation configuration and during which the web of packaging material (3) is accumulated within the buffer unit (5);

wherein a step of normal buffering is executed when the buffer unit (5) is controlled in the buffering configuration and during which a free loop (24) of the web of packaging material (3) is maintained within the buffer unit (5); and

wherein a decumulation step is executed when the buffer unit (5) is controlled in the decumulation configuration and during which the web of packaging material (3) is decumulated from the buffer unit (5).

14. Method according to claim 12 or 13, and further comprising a step of splicing, during which a web of packaging material (3) in use is spliced with a new web of packaging material (3);
wherein the step of accumulating is executed prior to the step of splicing.

Patentansprüche

1. Puffereinheit (5) für eine Verpackungsvorrichtung (1) zum Formen von Verpackungen (2) aus einer Bahn aus Verpackungsmaterial (3), die mit einem fließfähigen Produkt gefüllt werden;

wobei die Puffereinheit (5) konfiguriert ist, die Bahn aus Verpackungsmaterial (3) zu puffern, und Folgendes umfasst:

- eine Einlaufwalzenvorrichtung (20), die konfiguriert ist, die Bahn aus Verpackungsmaterial (3) in die Puffereinheit (5) zu führen;
- eine Auslaufwalzenvorrichtung (21), die konfiguriert ist, die Bahn aus Verpackungsmaterial (3) aus der Puffereinheit (5) zu führen;

dadurch gekennzeichnet, dass die Puffereinheit (5) ferner Folgendes umfasst:

- ein Sammelgehäuse (22), das einen Sammelraum (23) aufweist, der konfiguriert ist, die Bahn aus Verpackungsmaterial (3) willkürlich aufzunehmen;

wobei die Puffereinheit (5) in einer Sammelkon-

figuration gesteuert werden kann, in der die Bahn aus Verpackungsmaterial (3) in der Puffereinheit (5) willkürlich gesammelt wird;

wobei das Sammelgehäuse (22) eine Hauptwand (26), mehrere seitliche Begrenzungswände (27) quer zur Hauptwand (26) und eine Hauptöffnung (28), durch die die Bahn aus Verpackungsmaterial (3) in den Sammelraum (23) eintritt, umfasst;

wobei dann, wenn im Einsatz die Puffereinheit (5) in der Sammelkonfiguration gesteuert wird, die Bahn aus Verpackungsmaterial (3) die Form einer freien Schlaufe hat, bis die Bahn aus Verpackungsmaterial (3) dann, wenn die Bahn aus Verpackungsmaterial (3) im Sammelgehäuse (22) willkürlich verteilt wird, die Hauptwand (26) zu berühren beginnt.

2. Puffereinheit nach Anspruch 1, die außerdem in einer Pufferkonfiguration gesteuert werden kann; wobei die Puffereinheit (5) so konfiguriert ist, dass die Bahn aus Verpackungsmaterial (3) in einer freien Schlaufe (24) zwischen der Einlaufwalzenvorrichtung (20) und der Auslaufwalzenvorrichtung (21) angeordnet ist, während die Puffereinheit (5) in der Pufferkonfiguration gesteuert wird.

3. Puffereinheit nach Anspruch 1 oder 2, wobei die Puffereinheit (5) auch in einer Freigabekonfiguration gesteuert werden kann; wobei die Puffereinheit (5) so konfiguriert ist, dass dann, während die Puffereinheit (5) in der Freigabekonfiguration gesteuert wird, die willkürlich angeordnete Bahn aus Verpackungsmaterial (3) aus dem Sammelraum (23) freigegeben wird.

4. Puffereinheit nach einem der vorhergehenden Ansprüche, wobei die Bahn aus Verpackungsmaterial (3) zwischen der Einlaufwalzenvorrichtung (20) und der Auslaufwalzenvorrichtung (21) frei und willkürlich verläuft, während die Puffereinheit (5) in der Sammelkonfiguration gesteuert wird.

5. Puffereinheit nach einem der vorhergehenden Ansprüche, wobei die Hauptwand (26) gegenüber der Hauptöffnung (28) liegt.

6. Puffereinheit nach einem der vorhergehenden Ansprüche, wobei die Einlaufwalzenvorrichtung (20) eine Antriebswalze (32) und wenigstens eine Gegenwalze (33) umfasst.

7. Puffereinheit nach einem der vorhergehenden Ansprüche, wobei die Auslaufwalzenvorrichtung (21) eine Hauptwalze (35) und wenigstens eine Gegenwalze (36) umfasst.

8. Puffereinheit nach Anspruch 6 und 7, wobei die Bahn

aus Verpackungsmaterial (3) zwischen der Antriebswalze (32) und der Hauptwalze (35) frei verläuft.

9. Puffereinheit nach einem der vorhergehenden Ansprüche, wobei die Einlaufwalzenvorrichtung (20) so konfiguriert ist, dass sie eine Einlaufgeschwindigkeit der Bahn aus Verpackungsmaterial (3) in die Puffereinheit (5) derart beibehält, dass sie höher als eine Auslaufgeschwindigkeit der Bahn aus Verpackungsmaterial (3) aus der Puffereinheit (5) ist, während die Puffereinheit (5) im Einsatz in der Sammelkonfiguration gesteuert wird. 5 10
10. Verpackungsvorrichtung (1) zum Formen von Verpackungen (2) aus einer Bahn aus Verpackungsmaterial (3), die mit einem fließfähigen Produkt gefüllt werden; 15 wobei die Verpackungsvorrichtung (1) Folgendes umfasst:
- eine Transportvorrichtung (4) zum Transportieren der Bahn aus Verpackungsmaterial (3) längs eines Bahnbewegungspfads (P);
 - eine Puffereinheit (5) nach einem der vorhergehenden Ansprüche;
 - eine Vorrichtung (6) zum Formen und Abdichten eines Rohrs, die konfiguriert ist, aus der Bahn aus Verpackungsmaterial (3) ein Rohr (7) zu formen und in Längsrichtung abzudichten, und die stromaufwärts der Puffereinheit (5) längs des Bahnbewegungspfads (P) angeordnet ist;
 - eine Füllvorrichtung (8), die konfiguriert ist, im Einsatz das fließfähige Produkt in das Rohr (7) zu leiten; und
 - eine Verpackungsformungseinheit, die konfiguriert ist, im Einsatz wenigstens das sich vorwärtsbewegende Rohr (7) zu formen und quer abzudichten, um die Verpackungen (2) zu formen. 20 25 30 35 40
11. Verpackungsvorrichtung nach Anspruch 10, die ferner eine Spleißeinheit umfasst, die konfiguriert ist, eine neue Bahn aus Verpackungsmaterial (3) mit der Bahn aus Verpackungsmaterial (3) im Einsatz zu verspleißen; 45 wobei die Puffereinheit (5) so konfiguriert ist, dass sie vor einer Aktivierung der Spleißeinheit in der Sammelkonfiguration gesteuert wird.
12. Verfahren zum Formen von Verpackungen (2) aus einer Bahn aus Verpackungsmaterial (3), die mit einem fließfähigen Produkt gefüllt werden, wobei das Verfahren wenigstens die folgenden Schritte umfasst: 50 55
- Bewegen der Bahn aus Verpackungsmaterial (3) längs eines Bahnbewegungspfads (P);

- Formen eines Rohrs (7) aus der Bahn aus Verpackungsmaterial (3);
 - Abdichten des Rohrs (7) in Längsrichtung;
 - Befüllen des Rohrs (7) mit dem fließfähigen Produkt; und
 - Sammeln der Bahn aus Verpackungsmaterial (3), während eine Puffereinheit (5) die Bahn aus Verpackungsmaterial (3) sammelt;
- wobei die Puffereinheit (5) Folgendes umfasst:

- eine Einlaufwalzenvorrichtung (20), die konfiguriert ist, die Bahn aus Verpackungsmaterial (3) in die Puffereinheit (5) zu führen;
- eine Auslaufwalzenvorrichtung (21), die konfiguriert ist, die Bahn aus Verpackungsmaterial (3) aus der Puffereinheit (5) herauszuführen;

dadurch gekennzeichnet, dass die Puffereinheit (5) ferner Folgendes umfasst:

- ein Sammelgehäuse (22), das einen Sammelraum (23) aufweist, der konfiguriert ist, die Bahn aus Verpackungsmaterial (3) willkürlich aufzunehmen;

wobei während des Sammelstschritts die Puffereinheit (5) die Bahn aus Verpackungsmaterial (3) im Sammelraum (23) willkürlich sammelt; wobei das Sammelgehäuse (22) eine Hauptwand (26), mehrere seitliche Begrenzungswände (27) quer zur Hauptwand (26) und eine Hauptöffnung (28), durch die die Bahn aus Verpackungsmaterial (3) in den Sammelraum (23) eintritt, umfasst; wobei im Einsatz die Bahn aus Verpackungsmaterial (3) dann, wenn die Puffereinheit (5) in der Sammelkonfiguration gesteuert wird, die Form einer freien Schlaufe hat, bis die Bahn aus Verpackungsmaterial (3) die Hauptwand (26) zu berühren beginnt, wenn die Bahn aus Verpackungsmaterial (3) im Sammelgehäuse (22) willkürlich verteilt wird.

13. Verfahren nach Anspruch 12, das ferner einen Schritt zum Steuern der Puffereinheit (5) in einer der folgenden Konfigurationen umfasst:

- eine Sammelkonfiguration zum Sammeln der Bahn aus Verpackungsmaterial (3) in der Puffereinheit (5);
- eine Pufferkonfiguration, bei der die Puffereinheit (5) die Menge der Bahn aus Verpackungsmaterial (3) in der Puffereinheit (5) im Wesentlichen konstant hält; und
- eine Freigabekonfiguration, während der die Bahn aus Verpackungsmaterial (3), die in der

Puffereinheit (5) vorliegt, freigegeben wird; wobei der Schritt zum Sammeln ausgeführt wird, während die Puffereinheit (5) in der Sammelkonfiguration gesteuert wird, und während die Bahn aus Verpackungsmaterial (3) in der Puffereinheit (5) gesammelt wird; wobei ein Schritt einer normalen Pufferung ausgeführt wird, wenn die Puffereinheit (5) in der Pufferkonfiguration gesteuert wird und während eine freie Schlaufe (24) der Bahn aus Verpackungsmaterial (3) in der Puffereinheit (5) gehalten wird; und wobei ein Freigabeschritt ausgeführt wird, wenn die Puffereinheit (5) in der Freigabekonfiguration gesteuert wird und während die Bahn aus Verpackungsmaterial (3) aus der Puffereinheit (5) freigegeben wird.

14. Verfahren nach Anspruch 12 oder 13, das ferner einen Schritt zum Spleißen umfasst, in dem eine Bahn aus Verpackungsmaterial (3) im Einsatz mit einer neuen Bahn aus Verpackungsmaterial (3) verspleißt wird; wobei der Schritt des Sammelns vor dem Schritt des Spleißens ausgeführt wird.

Revendications

1. Unité tampon (5) pour un appareil (1) d'emballage destiné à former des emballages (2) à partir d'une bande de matériau (3) d'emballage et en cours de remplissage avec un produit versable ;

l'unité tampon (5) étant configurée pour mettre en tampon la bande de matériau (3) d'emballage et comportant :

- un dispositif (20) de rouleau d'approvisionnement configuré pour introduire la bande de matériau (3) d'emballage dans l'unité tampon (5) ;
- un dispositif (21) de rouleau d'extraction configuré pour orienter la bande de matériau (3) d'emballage hors de l'unité tampon (5) ;

caractérisée en ce que l'unité tampon (5) comporte en outre :

- une enceinte (22) d'accumulation dotée d'un espace (23) d'accumulation configuré pour recevoir aléatoirement la bande de matériau (3) d'emballage ;

l'unité tampon (5) pouvant être commandée dans une configuration d'accumulation, dans laquelle la bande de matériau (3) d'emballage est

accumulée aléatoirement à l'intérieur de l'unité tampon (5) ;

l'enceinte (22) d'accumulation comportant une paroi principale (26), une pluralité de parois latérales (27) de délimitation transversales à la paroi principale (26) et une ouverture principale (28) à travers laquelle la bande de matériau (3) d'emballage entre dans l'espace (23) d'accumulation ;

la bande de matériau (3) d'emballage présentant, lorsqu'en cours d'utilisation l'unité tampon (5) est commandée dans la configuration d'accumulation, la forme d'une boucle libre jusqu'à ce que la bande de matériau (3) d'emballage commence à toucher la paroi principale (26), puis la bande de matériau (3) d'emballage devenant répartie aléatoirement à l'intérieur de l'enceinte (22) d'accumulation.

2. Unité tampon selon la revendication 1, et pouvant également être commandée dans une configuration de mise en tampon ;

l'unité tampon (5) étant configurée de telle façon que la bande de matériau (3) d'emballage soit agencée en une boucle libre (24) entre le dispositif (20) de rouleau d'approvisionnement et le dispositif (21) de rouleau d'extraction pendant que l'unité tampon (5) est commandée dans la configuration de mise en tampon.

3. Unité tampon selon la revendication 1 ou 2, l'unité tampon (5) pouvant également être commandée dans une configuration de dispensation ;

l'unité tampon (5) étant configurée de telle façon que, pendant que l'unité tampon (5) est commandée dans la configuration de dispensation, la bande aléatoirement agencée de matériau (3) d'emballage soit dispensée hors de l'espace (23) d'accumulation.

4. Unité tampon selon l'une quelconque des revendications précédentes, la bande de matériau (3) d'emballage s'étendant librement et aléatoirement entre le dispositif (20) de rouleau d'approvisionnement et le dispositif (21) de rouleau d'extraction pendant que l'unité tampon (5) est commandée dans la configuration d'accumulation.

5. Unité tampon selon l'une quelconque des revendications précédentes, la paroi principale (26) étant opposée à l'ouverture principale (28).

6. Unité tampon selon l'une quelconque des revendications précédentes, le dispositif (20) de rouleau d'approvisionnement comportant un rouleau (32) d'entraînement et au moins un galet presseur (33).

7. Unité tampon selon l'une quelconque des revendications précédentes, le dispositif (21) de rouleau

- d'extraction comportant un rouleau principal (35) et au moins un galet presseur (36).
8. Unité tampon selon la revendication 6 et 7, la bande de matériau (3) d'emballage s'étendant librement entre le rouleau (32) d'entraînement et le rouleau principal (35). 5
9. Unité tampon selon l'une quelconque des revendications précédentes, le dispositif (20) de rouleau d'approvisionnement étant configuré de manière à maintenir une vitesse d'introduction de la bande de matériau (3) d'emballage dans l'unité tampon (5) pour qu'elle soit supérieure à une vitesse de dispensation de la bande de matériau (3) d'emballage à partir de l'unité tampon (5) pendant que l'unité tampon (5) est, en cours d'utilisation, commandée dans la configuration d'accumulation. 10 15
10. Appareil (1) d'emballage destiné à former des emballages (2) à partir d'une bande de matériau (3) d'emballage et en cours de remplissage avec un produit versable ; 20
l'appareil (1) d'emballage comportant :
- un dispositif (4) de transport servant à faire avancer la bande de matériau (3) d'emballage le long d'un trajet (P) d'avance de bande ;
 - une unité tampon (5) selon l'une quelconque des revendications précédentes ; 30
 - un dispositif (6) de formation et de scellage de tube configuré pour former et sceller longitudinalement un tube (7) à partir de la bande de matériau (3) d'emballage et qui est disposé en amont de l'unité tampon (5) le long du trajet (P) d'avance de bande ; 35
 - un dispositif (8) de remplissage configuré pour orienter, en cours d'utilisation, le produit versable dans le tube (7) ; et
 - une unité de formation d'emballages configurée pour au moins former et sceller transversalement le tube (7) qui avance, en cours d'utilisation, pour former les emballages (2). 40
11. Appareil d'emballage selon la revendication 10, et comportant en outre une unité de jonction configuré pour joindre une nouvelle bande de matériau (3) d'emballage à la bande de matériau (3) d'emballage en cours d'utilisation ; 45
l'unité tampon (5) étant configurée pour être commandée dans la configuration d'accumulation avant une activation de l'unité de jonction. 50
12. Procédé de formation d'emballages (2) à partir d'une bande de matériau (3) d'emballage et en cours de remplissage avec un produit versable comportant au moins les étapes consistant à : 55

- faire avancer la bande de matériau (3) d'emballage le long d'un trajet (P) d'avance de bande ;
 - former un tube (7) à partir de la bande de matériau (3) d'emballage ;
 - sceller longitudinalement le tube (7) ;
 - remplir le tube (7) du produit versable ; et
 - accumuler la bande de matériau (3) d'emballage, étape pendant laquelle une unité tampon (5) accumule la bande de matériau (3) d'emballage ;
- l'unité tampon (5) comportant :

- un dispositif (20) de rouleau d'approvisionnement configuré pour introduire la bande de matériau (3) d'emballage dans l'unité tampon (5) ;
- un dispositif (21) de rouleau d'extraction configuré pour orienter la bande de matériau (3) d'emballage hors de l'unité tampon (5) ;

caractérisée en ce que l'unité tampon (5) comporte en outre :

- une enceinte (22) d'accumulation dotée d'un espace (23) d'accumulation configuré pour recevoir aléatoirement la bande de matériau (3) d'emballage ; l'unité tampon (5), pendant l'étape d'accumulation, accumulant aléatoirement la bande de matériau (3) d'emballage à l'intérieur de l'espace (23) d'accumulation ;

l'enceinte (22) d'accumulation comportant une paroi principale (26), une pluralité de parois latérales (27) de délimitation transversales à la paroi principale (26) et une ouverture principale (28) à travers laquelle la bande de matériau (3) d'emballage entre dans l'espace (23) d'accumulation ;
la bande de matériau (3) d'emballage présentant en cours d'utilisation, lorsque l'unité tampon (5) est commandée dans la configuration d'accumulation, la forme d'une boucle libre jusqu'à ce que la bande de matériau (3) d'emballage commence à toucher la paroi principale (26), puis la bande de matériau (3) d'emballage devenant répartie aléatoirement à l'intérieur de l'enceinte (22) d'accumulation.

13. Procédé selon la revendication 12, et comportant en outre une étape consistant à commander l'unité tampon (5) dans une configuration parmi :

- une configuration d'accumulation servant à accumuler la bande de matériau (3) d'emballage à l'intérieur de l'unité tampon (5) ;

- une configuration de mise en tampon dans laquelle l'unité tampon (5) maintient la quantité de la bande de matériau (3) d'emballage à l'intérieur de l'unité tampon (5) sensiblement constante ; et 5

- une configuration de dispensation pendant laquelle la bande de matériau (3) d'emballage présente à l'intérieur de l'unité tampon (5) est dispensée ; l'étape d'accumulation étant exécutée pendant que l'unité tampon (5) est commandée dans la configuration d'accumulation et pendant laquelle la bande de matériau (3) d'emballage est accumulée à l'intérieur de l'unité tampon (5) ; 10

une étape de mise en tampon normale étant exécutée lorsque l'unité tampon (5) est commandée dans la configuration de mise en tampon et pendant laquelle une boucle libre (24) de la bande de matériau (3) d'emballage est maintenue à l'intérieur de l'unité tampon (5) ; et 15

une étape de dispensation étant exécutée lorsque l'unité tampon (5) est commandée dans la configuration de dispensation et pendant laquelle la bande de matériau (3) d'emballage est dispensée à partir de l'unité tampon (5). 20 25

- 14.** Procédé selon la revendication 12 ou 13, et comportant en outre une étape de jonction, pendant laquelle une bande de matériau (3) d'emballage en cours d'utilisation est jointe à une nouvelle bande de matériau (3) d'emballage ; 30
- l'étape d'accumulation étant exécutée avant l'étape de jonction. 35

35

40

45

50

55

FIG. 1

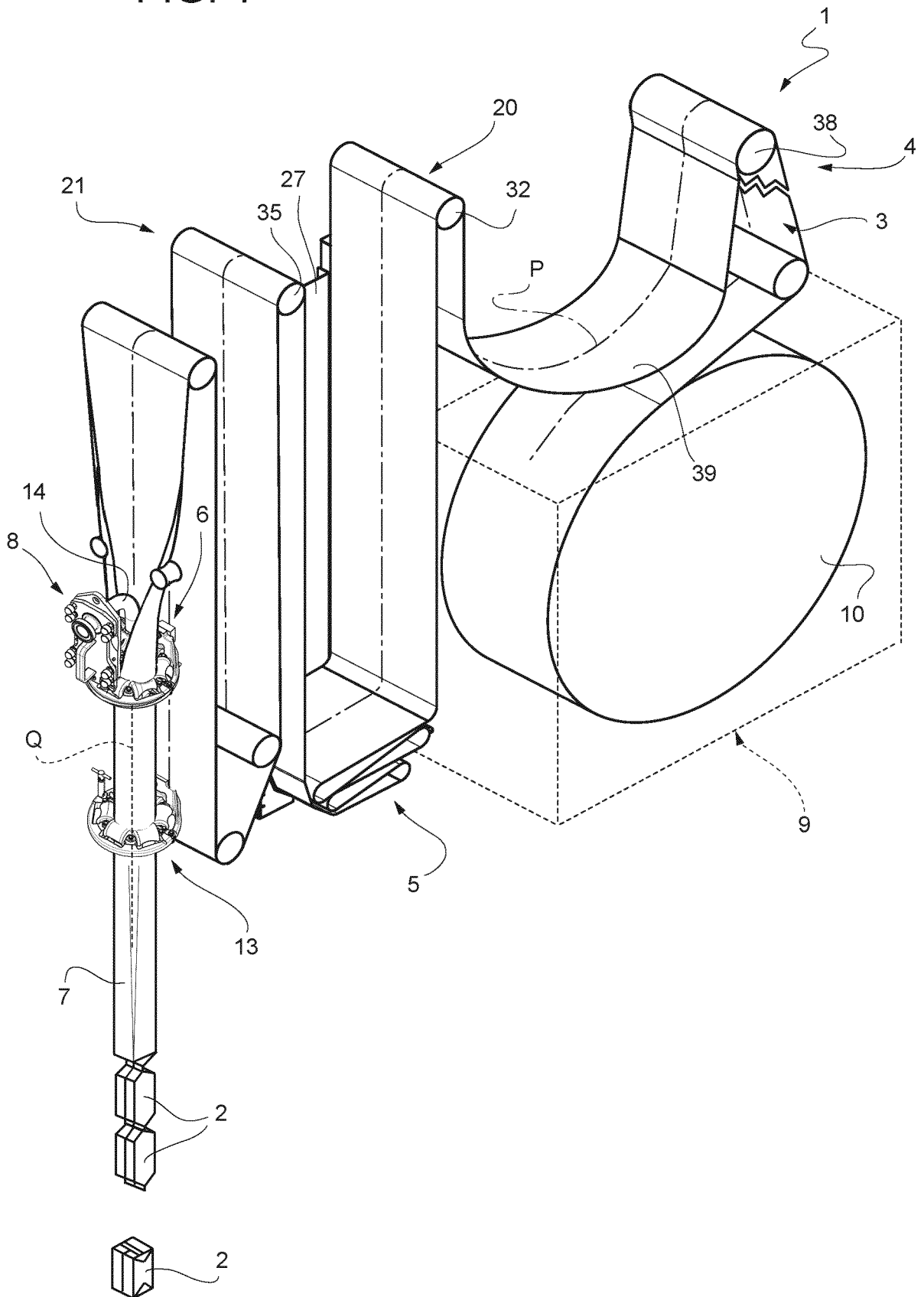


FIG. 2

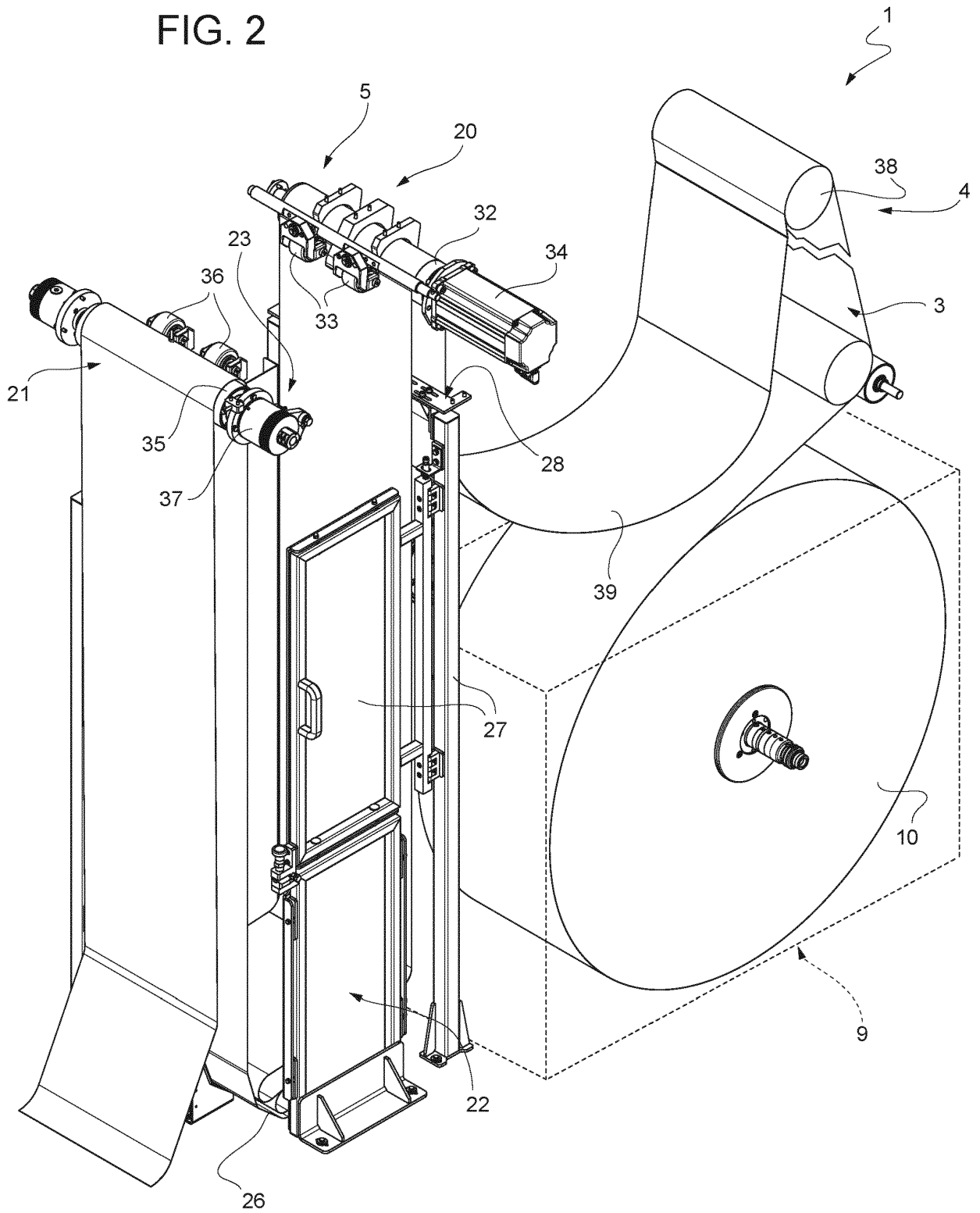


FIG. 3

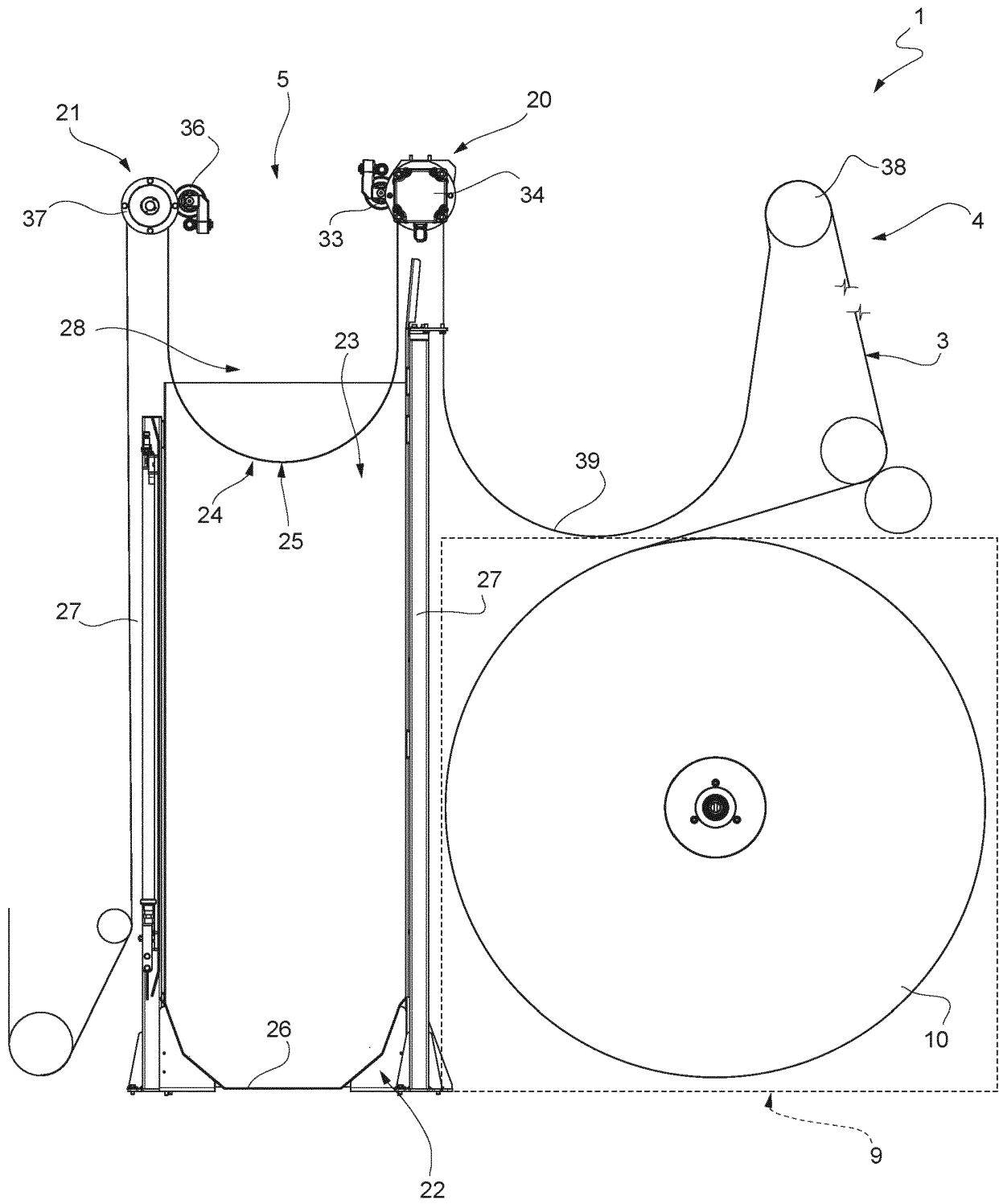


FIG. 4

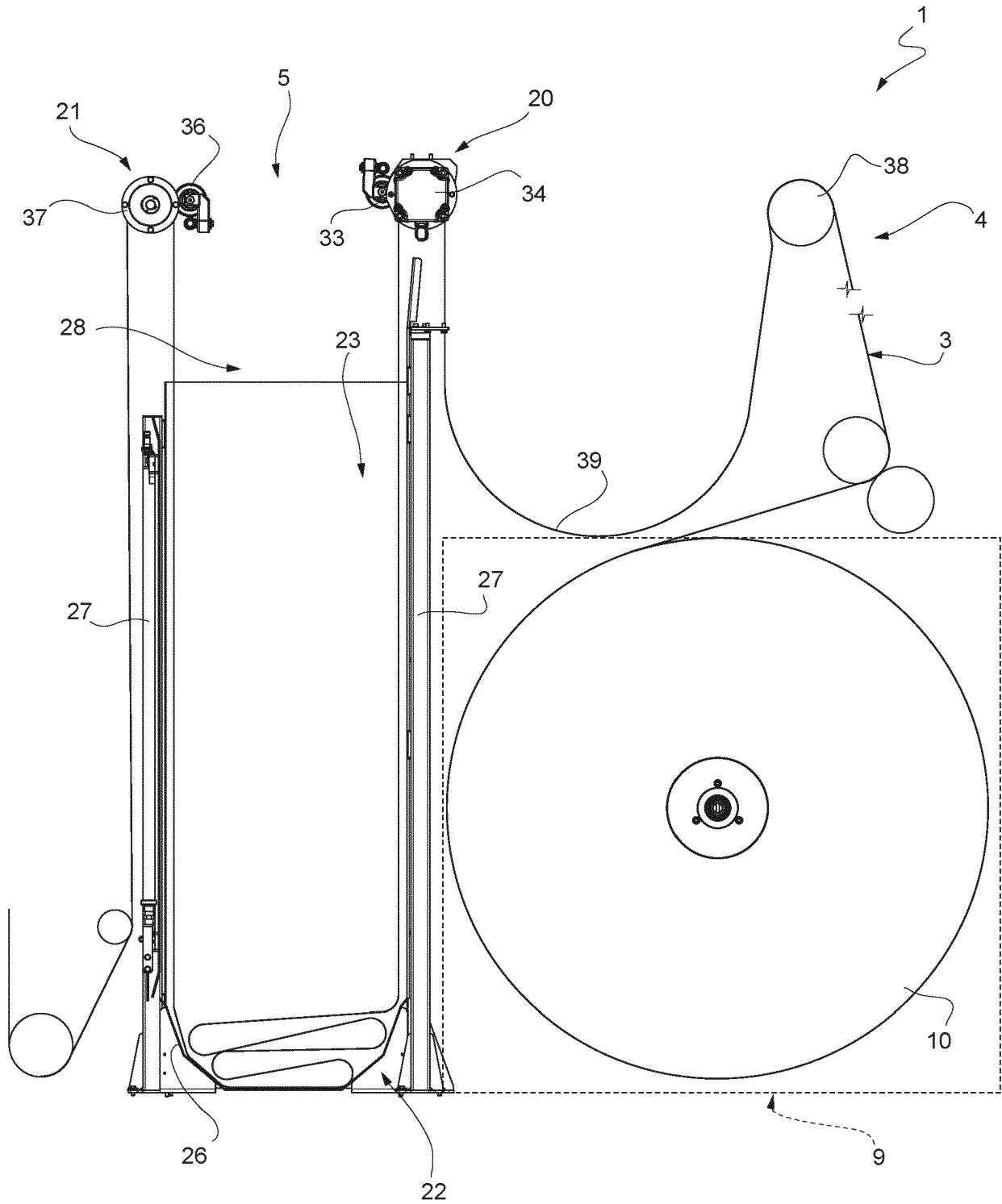
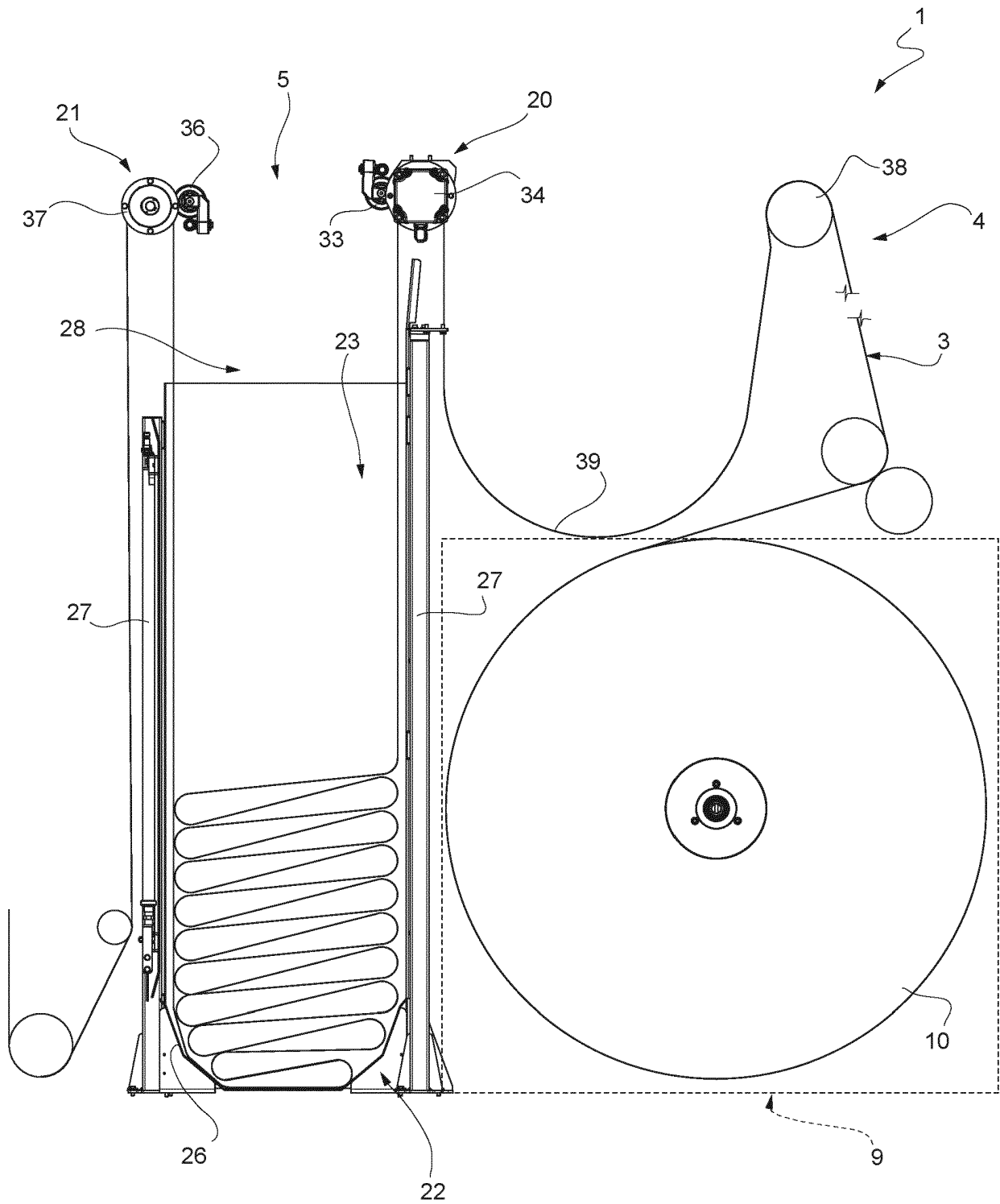


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 3725689 A1 [0015]
- EP 3725692 A1 [0016]