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(54) **A PACKAGING MATERIAL ARRANGEMENT, A ROLL-FED PACKAGING MACHINE, A SYSTEM AND METHODS RELATED THERETO**

(57) A packaging material arrangement (102) for a roll-fed packaging machine (100) is provided. The arrangement (102) comprises a reel (300) formed as a hollow cylinder with a cylindrical inner surface (302), a cylindrical outer surface (304), and a ring-shaped side surface (306). The reel (300) is arranged to be rotatably connected with a shaft (308) of a reel receiver (118) of the roll-fed packaging machine (100). Further, the arrangement comprises a web (104) of packaging material rolled-up on the reel (300), wherein the web (104) comprises a number of sub-portions (310a, 310b) placed after one another, each sub-portion being arranged to be formed into a package (116). The ring-shaped side surface (306) is provided with a pattern (312) such that a rotational position of the reel (300) with respect to the reel receiver (118) can be determined by using a sensor (314) fixedly arranged on the reel receiver (118).

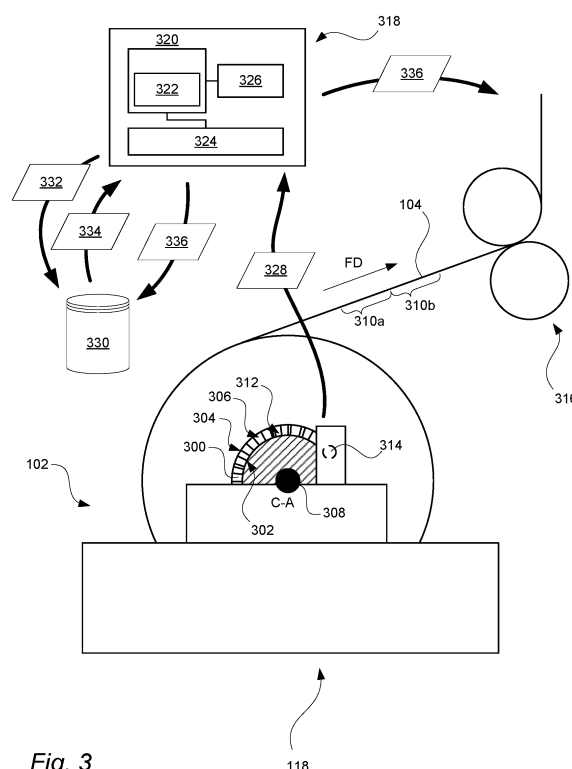


Fig. 3

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Description

Technical Field

[0001] The invention generally relates to packaging technology. More particularly, it is related to a packaging material arrangement, a roll-fed packaging machine, a system and methods related thereto that provide improved control during the course of producing packages by the roll-fed packaging machine.

Background Art

[0002] Today, it is commonly known to use so-called roll-fed packaging machines, sometimes referred to as filling machines, for producing packages filled with food product. Different packaging material can be used for producing such packages. A well-known packaging material to use in this context is a carton-based laminate. In short, such laminate can comprise a carton-based layer for providing rigidity and plastic layers for protecting the carton-based layer from moisture as well as for preventing oxygen and unwanted microorganisms to reach the food product. This type of packaging material is by way of example marketed by Tetra Pak™.

[0003] A common approach is to produce packaging material in factories, sometimes referred to as converting factories, and distribute the packaging material to dairies or other food production facilities. Most often, once produced and printed, a web of packaging material is rolled up on a reel such that the packaging material can be securely and efficiently transported to production sites, i.e. the dairies or other food production facilities.

[0004] On the production sites, to avoid any interruption when switching from one reel to another, it is common to have roll-fed packaging machines provided with so-called automatic splicing units (ASU). In short, the ASUs are arranged such that the web of a reel soon to be emptied can be connected to the web of a new reel with packaging material such that continuous production can be provided.

[0005] To further improve the switching from one reel to another, each reel may be provided with an RFID tag or similar and the packaging machine may be provided with a tag reader such that the RFID tag can be read once the reel is received. An advantage with this approach is that data stored on the RFID tag can be transmitted to the packaging machine. In this way, information about the packaging material can be provided to the packaging machine such that machine settings can be adjusted automatically.

[0006] Another known approach to improve the control during the course of transforming the web of packaging material into packages is to use QR codes or the like. More particularly, by having each sub-section of the web provided with a unique code, e.g. a QR code, these sub-sections can be traced throughout the packaging machine and also after the sub-sections have been trans-

formed into packages, that is, downstream the packaging machine. In this way, by having increased information about where in the packaging machine the different sub-sections are placed at a given point of time, an increased understanding of the operation of the packaging machine is provided, which in turn provide for improved control.

[0007] Even though it is known to have the reels of packaging material provided with RFID tags or the like and also to have codes provided on the different sub-sections of the packaging material, these approaches are not always suitable and does not always provide all information that may be needed. For instance, the RFID tag may at times be difficult to read and it also adds an extra cost both to the reel and the packaging machine. Providing codes on each sub-section also comes with an extra cost.

[0008] Thus, even though there are different technologies and solutions available today for detailed control of the operation of roll-fed packaging machines, there is a need for cost-efficient, but yet reliable solutions for providing continuous information about the operation of the roll-fed packaging machine.

Summary

[0009] It is an object of the invention to at least partly overcome one or more of the above-identified limitations of the prior art. In particular, it is an object to provide a cost-efficient, but yet reliable solution for controlling the operation of a roll-fed packaging machine. More particularly, it is an object to provide more detailed information about the remaining number of packages that can be produced before the reel with packaging material has to be replaced by a new one.

[0010] According to a first aspect it is provided a packaging material arrangement for a roll-fed packaging machine. The arrangement comprises

a reel formed as a hollow cylinder with a cylindrical inner surface, a cylindrical outer surface, and a ring-shaped side surface, wherein the reel may be arranged to be rotatably connected with a shaft of a reel receiver of the roll-fed packaging machine, and a web of packaging material rolled-up on the reel, wherein the web may comprise a number of sub-portions placed after one another, each sub-portion being arranged to be formed into a package, wherein the ring-shaped side surface may be provided with a pattern such that a rotational position of the reel with respect to the reel receiver can be determined by using a sensor fixedly arranged on the reel receiver.

[0011] An advantage with the packaging material arrangement above is that by continuously determining the rotational position of the reel it is made possible to determine the number of sub-portions remaining on the reel at any given point of time. In this way, an operator of the

packaging machine can be provided with more detailed information about the current status of the filling machine.

[0012] The pattern may be reel-specific such that the roll-fed packaging machine can identify the packaging material arrangement based on the pattern.

[0013] Even though it is possible to use the same pattern for all reels to determine the rotational position, using a reel-specific pattern comes with a number of advantages. For instance, by having the possibility to identify the reel it is possible to store and retrieve data in a database in case the reel is used in the packaging machine at several occasions. Further, by having the possibility to identify the reel based on the pattern, information related to the packaging material of the reel may be retrieved from the database or any other data storage apparatus. Put differently, a reel-specific pattern may serve dual purposes; determining the rotational position, and identifying the reel.

[0014] The pattern may comprise a two-dimensional printed pattern.

[0015] Using the two-dimensional printed pattern comes with the advantage that the pattern can be provided at a relatively low cost. In addition, using a two-dimensional pattern provide for that more information is made available via the pattern compared to a one-dimensional pattern, e.g. only radially extending lines, which provides for that more reliable measurements can be made.

[0016] The two-dimensional printed pattern may comprise a number of printed lines extending radially with respect to a center axis of the reel.

[0017] Using radially extending lines, either alone or in combination with other pattern features, provides for that the rotational position can be determined accurately.

[0018] The package material may comprise a number of layers, wherein at least one of these layers is a cellulose-based layer.

[0019] Using a cellulose-based layer, such as carton, reduces the environmental footprint of the packages being produced.

[0020] According to a second aspect, it is provided a roll-fed packaging machine for producing packages filled with liquid food product. The machine may comprise

a reel receiver arranged to receive a packaging material arrangement comprising a reel and a web of packaging material rolled-up on the reel, wherein the web may comprise a number of sub-portions placed after one another, each sub-portion being arranged to be formed into one of the packages, wherein a ring-shaped side surface of the reel may be provided with a pattern, a web feeder arranged to unroll the web of packaging material from the reel, and a sensor arranged on the reel receiver and configured to read the pattern of the ring-shaped side surface of the reel such that a rotational position of the reel with respect to the reel receiver can be

determined as the web is unrolled.

[0021] Similar to the advantages described above with respect to the first aspect, the advantage with having the roll-fed packaging machine according to the second aspect is that the number of sub-portions remaining on the reel can continuously be determined. The other advantages described above with respect to the first aspect also apply for this second aspect.

[0022] The packaging machine may further comprise a control device arranged to retrieve sensor output data from the sensor, to transform the sensor output data into a reel-specific code, to transmit a request for stored status data, pertaining to sub-positions of the web remaining on the reel, by transferring the reel-specific code to a database, and in response to the request, to receive the stored status data from the database.

[0023] The control device may further be configured to retrieve the sensor output data from the sensor as the web is unrolled by the web feeder, to determine rotational position data by determining the rotational position based on the sensor output data, and to determine a number of sub-portions rolled off based on the rotational position data, and to determine current status data being the stored status data deducted by the number of sub-portions rolled off since a point of time in which retrieving the stored status data from the database is initiated.

[0024] The control device may further be configured to detect that the reel is removed from the reel receiver, and, upon such detection, to transfer the current status data to the database together with a request to have the current status data set as the stored status data.

[0025] The control device may further be configured to request product information data, packaging material characteristics data, sealing settings data, machine settings data, transportation log data and/or storage log data linked to the reel-specific code from the database.

[0026] According to a third aspect, it is provided a system comprising the roll-fed packaging machine, a number of packaging material arrangements according to the first aspect, and a database holding stored status data for the number of packaging material arrangements.

[0027] According to a fourth aspect, it is provided a method for producing the packaging material arrangement according to the first aspect. The method may comprise

receiving the reel,
providing the pattern onto the ring-shaped side surface of the reel, and
rolling up the web of packaging material onto the reel.

[0028] The pattern may be reel-specific and linked to a reel code, and the method may further comprise

determining the number of sub-portions of the web rolled up onto the reel, and
uploading data pertaining to the number of sub-portions

tions together with the reel code to the database.

[0029] According to a fifth aspect, it is provided a method for providing current status data pertaining to a number of sub-portions remaining on the packaging material arrangement according to the first aspect held by the roll-fed packaging machine according to the second aspect. The method may comprise

retrieving, by using the control device of the packaging machine, sensor output data from the sensor arranged on the reel receiver of the packaging machine, wherein the sensor may be configured to read the pattern of the ring-shaped side surface of a reel of the packaging material arrangement,
determining, by using the control device, rotational position data by determining the rotational position of the reel based on the sensor output data,
determining, by using the control device, a number of sub-portions rolled off based on the rotational position data, and
determining, by using the control, the current status data by deducting the number of sub-portions from a stored status data, wherein the stored status data pertains to the number of sub-portions remaining on the reel at a time of retrieving sensor output data is initiated.

[0030] According to a sixth aspect, it is provided a computer program product comprising instructions, which when the program is executed by the control device, cause the control device to carry out the steps of the method according to the fifth aspect.

[0031] Still other objectives, features, aspects and advantages of the invention will appear from the following detailed description as well as from the drawings.

Brief Description of the Drawings

[0032] Embodiments of the invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Fig. 1 is a general illustration of a roll-fed packaging machine.

Fig. 2 is a perspective view of a package produced by the packaging machine of fig. 1.

Fig. 3 illustrates a reel receiver holding a packaging material arrangement in further detail.

Fig. 4 is a flowchart illustrating a method for producing the packaging material arrangement.

Fig. 5 is a flowchart illustrating a method for providing current status data pertaining to the number of sub-portions remaining on the packaging material arrangement.

Detailed Description

[0033] The present inventive concept will now be described more fully hereinafter with reference to the accompanying drawings, in which some variants of the inventive concept are shown. This inventive concept may, however, be implemented in many different forms and should not be construed as limited to the variants set forth herein; rather, these variants are provided for thoroughness and completeness, and fully convey the scope of the present inventive concept to the skilled person.

[0034] It is also to be understood that the terminology used herein is for purpose of describing particular embodiments only, and is not intended to be limiting. It should be noted that, as used in the specification and the appended claim, the articles "a", "an", "the", and "said" are intended to mean that there are one or more of the elements unless the context clearly dictates otherwise. Thus, for example, reference to "a unit" or "the unit" may refer to more than one unit in some contexts, and the like. Furthermore, the words "comprising", "including", "containing" do not exclude other elements or steps. It should be emphasized that the term "comprises/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps, or components. It does not preclude the presence or addition of one or more other features, integers, steps, components, or groups thereof. The term "and/or" is to be interpreted as meaning "both" or each as an alternative.

[0035] It will also be understood that, although the term first, second, etc. may be used herein to describe various elements or features, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first peripheral section could be termed a second peripheral section, and, similarly, a second peripheral section could be termed a first peripheral section, without departing from the scope of the embodiments. The first peripheral section and the second peripheral section are both peripheral section, but they are not the same peripheral section.

[0036] Fig. 1 is a general illustration of a packaging machine 100. In the broadest form, the packaging machine 100 comprises a transversal sealing station 114 for transversally seal and cut a tube 112 of packaging material into packages first 116. The packaging material may comprise a paperboard layer, also referred to as carton or carton-based layer, and a plastic foil, sometimes referred to as plastic layer. The plastic foil may be attached to the paperboard layer. The transversal sealing station 114 may comprise a jaw system for continuously forming transversal sealings and cutting the tube into packages after the transversal sealings have been made. The packaging machine 100 may be a stand-alone packaging machine, or part of a larger food packaging or processing pipeline.

[0037] In the example illustrated in Fig. 1, the packaging machine 100 is a roll-fed packaging machine, the

general principles of which will be described in the following. In such a machine, the packaging material is provided on a packaging material arrangement 102, loaded into a reel receiver 118 of the packaging machine 100. From the arrangement 102, a web 104 of packaging material is formed. The web 104 of packaging material may pass through a sterilization station 106 for removing or reducing a number of unwanted microorganisms from the web 104. The sterilization may e.g. comprise a hydrogen peroxide bath, a Low Voltage Electron Beam (LVEB) device or any other suitable apparatus capable of meeting food safety regulations.

[0038] After sterilization, the web 104 can be formed into the tube 112, e.g. by a longitudinal sealing station 110. The tube 112 is formed by joining the two edges of the web 104 by a longitudinal sealing, LS. The wording "longitudinal" herein relates to the longitudinal direction of the web 104 or tube 112 of packaging material. Thus, the longitudinal direction coincides with a feeding direction, FD, in the packaging machine 100. When having formed the tube 112, a food product, FP, can be fed into the tube 112 via a product filling pipe 108, arranged at least partly inside the tube 112.

[0039] The filled tube 112 may thereafter reach the transversal sealing station 114. The wording "transversal" herein relates to a direction across the tube (i.e. a transversal direction, TD) once flattened in the transversal sealing station 114. In the transversal sealing station 114, a transversal sealing, TS, is made in a lower end of the tube 112. Generally, the transversal sealing station has two main functions; 1) providing the transversal sealing, i.e. welding two opposite sides of the tube 112 together such that the product in a lower part of the tube 112 is separated from the product in the tube 112 placed upward the ultrasonic sealing system 300, and 2) cutting off the lower part of the tube such that the package 116 is formed. Alternatively, instead of providing the transversal sealing and cutting off the lower part in one and the same station 114 as illustrated, the step of cutting off the lower part may be made in a subsequent step by a different piece of equipment, or by the consumer if the packages are intended to be sold in a multi-pack. After the package 116 has been formed, it may be folded in a folding station (not shown) thereby forming a finished food package.

[0040] As illustrated, the reel receiver 118 may be equipped with a reel ID reader 122 arranged to read a reel identification, ID, tag 120 on the reel 102. The reel ID tag 120 may comprise information identifying the reel. For example, the reel ID tag 120 may comprise information indicative of a type of packaging material on the reel 102, material properties of the packaging material (e.g. thickness, material composition, etc.), a type of package to be formed by the packaging material, or packaging machine settings to be used. The packaging machine 100 may further comprise a control device 126 comprising a processor 128 and a memory 130. The control device 126 may be configured to receive PM reel ID data extracted from the PM reel ID tag 120.

[0041] Fig. 2 illustrates, by way of example, the package 116 after a transversal sealing has been performed, but before it has been folded into the finished package. As illustrated, the package 116 is sealed in a transversal sealing section 200 spanning over two transversal ends of the package 116.

[0042] Along the longitudinal direction, LD, the package can be provided with a number of longitudinal crease lines 202a-c. The crease lines 202a-c should be interpreted as indentions or weakening lines. The crease lines 202a-c are typically embossed onto the packaging material during its manufacturing. The crease lines 202a-c are designed to facilitate folding of the packaging material into its intended shape. For example, the tube 112 of packaging material may be, during a transversal sealing state, formed into a desired shape (e.g. a shape having a rectangular cross section). The crease lines 202a-c may in this case be provided along the corners of the package to ensure that the package is formed accurately and consistently. In the illustrated example, the package 116 comprises a first crease line 202a, a second crease line 202b, a third crease line 202c and a fourth crease line (not shown) corresponding to the four corners of the package 116. However, it should be appreciated that the number of crease lines may be two or more depending on the type or shape of the package 116.

[0043] Fig. 3 illustrates by way of example the reel receiver 118 of the packaging material arrangement 102 in further detail. The arrangement 102 comprises a reel 300 having a cylindrical inner surface 302, a cylindrical outer surface 304 and a ring-shaped side surface 306 on either side of the reel. During operation, a shaft 308 of the reel receiver 118 is inserted into the reel 300 along a center axis (C-A) such that the web 104 can be unrolled from the reel 300 and fed into the packaging machine 100 along the feeding direction FD.

[0044] The web 104 can comprise a number of sub-portions 310a-b, each of the sub-portions being arranged to be formed into one of the packages 116. As described above, crease lines may be used for facilitating the transformation from the web 104 into the packages 116. The web 104 may be rolled off the reel 300 by using a web feeder 316, herein exemplified by two rollers. One of the rollers may be motor-driven and the other roller may be spring-loaded such that the web can be fed by the web feeder 316.

[0045] A sensor 314 arranged to read a pattern 312 of the ring-shaped side surface 306 can be placed on or in conjunction to the reel receiver 118. By reading the pattern 312, a rotational position of the reel 300 with respect to the reel receiver 118 can be determined as the web 104 is unrolled. The pattern 312 may be reel-specific such that which reel 300 that has been placed in the reel receiver 118 can be determined. Thus, in addition to determining the rotational position, the reel can also be identified by using the same pattern 312.

[0046] The pattern 312 may come in different forms. It may be a printed pattern. The printed pattern may be in

the form of a one-dimensional bar code pattern as illustrated, but it may also be a two-dimensional printed pattern. To provide for that the rotational position can be determined reliably and efficiently, the pattern 312 may comprise lines radially extending with respect to the center axis C-A.

[0047] Further, or in combination to having the pattern embodied as a printed pattern, the pattern may also be a magnetic mark-based pattern. In other words, magnetic particles can be provided in the reel 300 and the sensor 314 may be configured to register these magnetic marks as they are passing the sensor 314. Still a possibility, that can be used stand alone or in combination with the printed pattern and/or the magnetic mark-based pattern, is to have the pattern 312 formed by mechanical marks, for instance cut-outs made in the ring-shaped side surface 306.

[0048] By continuously measuring the rotational position of the reel 300, it is made possible to estimate the number sub-portions being unrolled from the reel 300. As an effect, it is made possible to continuously provide information to an operator about the number of remaining sub-portions on the reel 300, or put differently, the number of packages 116 that can be produced before the reel 300 is empty and has to be replaced by a new one.

[0049] Sensor output data 328 generated by the sensor 314 may be transferred from the sensor 314 to the control device 318, which may be the same control device 126 as illustrated in fig. 1 or a separate control device. The control device 318 may be an integral part of the packaging machine 100 or it may be external to the packaging machine 100. In the latter case, the sensor output data 328 may be transferred to the control device 318 via other pieces of equipment, e.g. data communication devices. The control device 318 can comprise control circuitry 320 holding a processor 322, a transceiver 324 and a memory 326. The control device 318 may also be communicatively connected to a database 330. The database 330 may be an integral part of the packaging machine 100 or it may be placed remotely, i.e. outside the packaging machine.

[0050] An advantage with having the database 330 is that, in case the pattern 312 provides the reel-specific code, the concept of determining the number of remaining sub-portions on the reel 300 may also be applied on reels for which some, but not all, sub-portions have been unrolled. For instance, in case small batches of food packages are being produced, it may be that only 25% of the web 104 is used before this is stored away for later use. Having the reel-specific code and the database 330 provides for that the number of remaining sub-portions can be stored such that this information can be used when the reel 300 is re-introduced into the packaging machine 100. This may be achieved by transmitting a request 332 for stored status data 334, pertaining to sub-portions 310a,b of the web 104 remaining on the reel 300 from the control device. In connection to the request, the reel-specific code is also provided to the database 330. In

response to the request 332, the stored status data 334 may be provided from the database 330 to the control device. As the web 104 is unrolled from the reel 300, the number of sub-portions 310a,b rolled off can be determined based on the sensor output data 328. By deducting the number of rolled off sub-portions from the stored status data 334, being the number of sub-portions on the reel 300 when this was most recently placed in the packaging machine 100, current status data 336 can be determined. To provide for that the database 330 is updated, the current status data 336 can be fed to the database 330 when the reel 300 is removed from the packaging machine 100.

[0051] Even though the pattern 312 placed on the ring-shaped side surface 306 may in itself provide for that the number of sub-portions left on the reel 300 can be determined, the concept can also be combined with other approaches to further increase the reliability. For instance, the concept may be combined with continuously weighing the reel as the web is unrolled to receive additional information on how much of the web 104 that is still on the reel 300. In addition, a light-based sensor, such as LIDAR, may be used for continuously determining a height reduction of a rolled-up web layer on the reel. Information obtained via such sensor may in combination with the information provided via the pattern 312 be used for providing the number of sub-portions left on the reel more accurately.

[0052] As illustrated in fig. 4, a method 400 for producing the packaging material arrangement 102 can comprise receiving 402 the reel 300, providing 404 the pattern 312 onto the ring-shaped side surface 306, e.g. by printing, and rolling up 406 the web onto the reel 300. Optionally, the method 400 may further comprise determining 408 the number of sub-portions 310a,b rolled up on the reel 300, and uploading 410 data pertaining to the number of sub-portions together with reel code to the database 330. Once uploaded, the data may be assigned as the stored status data 334.

[0053] With reference to fig. 5, a method 500 for providing the current status data 336 pertaining to the number of sub-portions 310a,b remaining on the packaging material arrangement 102 held by the roll-fed packaging machine is illustrated. The method 500 can comprise retrieving 502, by using the control device 318 of the packaging machine 100, the sensor output data 328 from the sensor 314 arranged on the reel receiver 118 of the packaging machine 100, wherein the sensor 314 is configured to read the pattern 312 of the ring-shaped side surface 306 of the reel 300 of the packaging material arrangement 102. Then, determining 504, by using the control device 318, rotational position data by determining the rotational position of the reel 300 based on the sensor output data 328, determining 506, by using the control device 318, the number of sub-portions 310a,b rolled off based on the rotational position data, and determining 508, by using the control 318, the current status data 336 by deducting the number of sub-portions

from the stored status data 334. The stored status data 334 pertains to the number of sub-portions remaining on the reel 300 at a time of retrieving sensor output data 328 is initiated.

[0054] From the description above follows that, although various embodiments of the invention have been described and shown, the invention is not restricted thereto, but may also be embodied in other ways within the scope of the subject-matter defined in the following claims.

Claims

1. A packaging material arrangement (102) for a roll-fed packaging machine (100), said arrangement (102) comprising
 - a reel (300) formed as a hollow cylinder with a cylindrical inner surface (302), a cylindrical outer surface (304), and a ring-shaped side surface (306), wherein the reel (300) is arranged to be rotatably connected with a shaft (308) of a reel receiver (118) of the roll-fed packaging machine (100), and
 - a web (104) of packaging material rolled-up on the reel (300), wherein the web (104) comprises a number of sub-portions (310a, 310b) placed after one another, each sub-portion being arranged to be formed into a package (116), wherein the ring-shaped side surface (306) is provided with a pattern (312) such that a rotational position of the reel (300) with respect to the reel receiver (118) can be determined by using a sensor (314) fixedly arranged on the reel receiver (118).
2. The packaging material arrangement (102) according to claim 1, wherein the pattern (312) is reel-specific such that the roll-fed packaging machine (100) can identify the packaging material arrangement (102) based on the pattern (312).
3. The packaging material arrangement (102) according to any one of the preceding claims, wherein the pattern (312) comprises a two-dimensional printed pattern.
4. The packaging material arrangement (102) according to claim 3, wherein the two-dimensional printed pattern comprises a number of printed lines extending radially with respect to a center axis (C-A) of the reel (300).
5. The packaging material arrangement (102) according to any one of the preceding claims, wherein the package material comprises a number of layers, wherein at least one of these layers is a cellulose-based layer.
6. A roll-fed packaging machine (100) for producing packages (116) filled with liquid food product (FP), said machine (100) comprising
 - a reel receiver (118) arranged to receive a packaging material arrangement (102) comprising a reel (300) and a web (104) of packaging material rolled-up on the reel (104), wherein the web (104) comprises a number of sub-portions (310a,b) placed after one another, each sub-portion being arranged to be formed into one of the packages (116), wherein a ring-shaped side surface (306) of the reel (300) is provided with a pattern (312),
 - a web feeder (316) arranged to unroll the web (104) of packaging material from the reel (300), and
 - a sensor (314) arranged on the reel receiver (118) and configured to read the pattern (312) of the ring-shaped side surface (306) of the reel (300) such that a rotational position of the reel (300) with respect to the reel receiver (118) can be determined as the web (104) is unrolled.
7. The roll-fed packaging machine (100) according to claim 6, further comprising
 - a control device (318) arranged to retrieve sensor output data (328) from the sensor (314), to transform the sensor output data (328) into a reel-specific code, to transmit a request (332) for stored status data (334), pertaining to sub-positions (310a,b) of the web (104) remaining on the reel (300), by transferring the reel-specific code to a database (330), and in response to the request (332), to receive the stored status data (334) from the database (330).
8. The roll-fed packaging machine (100) according to claim 7, wherein the control device (318) is further configured to retrieve the sensor output data (328) from the sensor (314) as the web (104) is unrolled by the web feeder (316), to determine rotational position data by determining the rotational position based on the sensor output data (328), and to determine a number of sub-portions (310a,b) rolled off based on the rotational position data, and to determine current status data (336) being the stored status data (334) deducted by the number of sub-portions (310a,b) rolled off since a point of time in which retrieving the stored status data (334) from the database (330) is initiated.
9. The roll-fed packaging machine (100) according to claim 8, wherein the control device (318) is further configured to detect that the reel (300) is removed from the reel receiver (118), and, upon such detection, to transfer the current status data (336) to the

database (300) together with a request to have the current status data (336) set as the stored status data (334).

10. The roll-fed packaging machine (100) according to any one of the claims 7 to 9, wherein the control device (318) is further configured to request product information data, packaging material characteristics data, sealing settings data, machine settings data, transportation log data and/or storage log data linked to the reel-specific code from the database (330).

11. A system comprising a roll-fed packaging machine (100) according to any one of claims 7 to 10, a number of packaging material arrangements (102) according to any one of the claims 2 to 5, and a database (330) holding stored status data (334) for the number of packaging material arrangements (102).

12. A method (400) for producing the packaging material arrangement (102) according to any one of the claims 1 to 6, said method comprising

receiving (402) a reel (300),
providing (404) a pattern (312) onto a ring-shaped side surface (306) of the reel (300), and
rolling up (406) a web (104) of packaging material onto the reel (300).

13. The method (400) according to claim 12, wherein the pattern (312) is reel-specific and linked to a reel code, said method further comprising

determining (408) a number of sub-portions (310a,b) of the web (104) rolled up onto the reel (300), and
uploading (410) data pertaining to the number of sub-portions (310a-b) together with the reel code to a database (330).

14. A method (500) for providing current status data (336) pertaining to a number of sub-portions (310a,b) remaining on a packaging material arrangement (102) according to any one of claim 1 to 5 held by a roll-fed packaging machine (100) according to any one of the claims 6 to 10, said method comprising

retrieving (502), by using a control device (318) of the packaging machine (100), sensor output data (328) from a sensor (314) arranged on a reel receiver (118) of the packaging machine (100), wherein the sensor (314) is configured to read a pattern (312) of a ring-shaped side surface (306) of a reel (300) of the packaging material arrangement (102),
determining (504), by using the control device

(318), rotational position data by determining a rotational position of the reel (300) based on the sensor output data (328),
determining (506), by using the control device (318), a number of sub-portions (310a,b) rolled off based on the rotational position data, and
determining (508), by using the control (318), the current status data (336) by deducting the number of sub-portions from a stored status data (334), wherein the stored status data (334) pertains to the number of sub-portions remaining on the reel (300) at a time of retrieving sensor output data (328) is initiated.

15. A computer program product comprising instructions, which when the program is executed by a control device (318), cause the control device (318) to carry out the steps of the method (500) of claim 14.

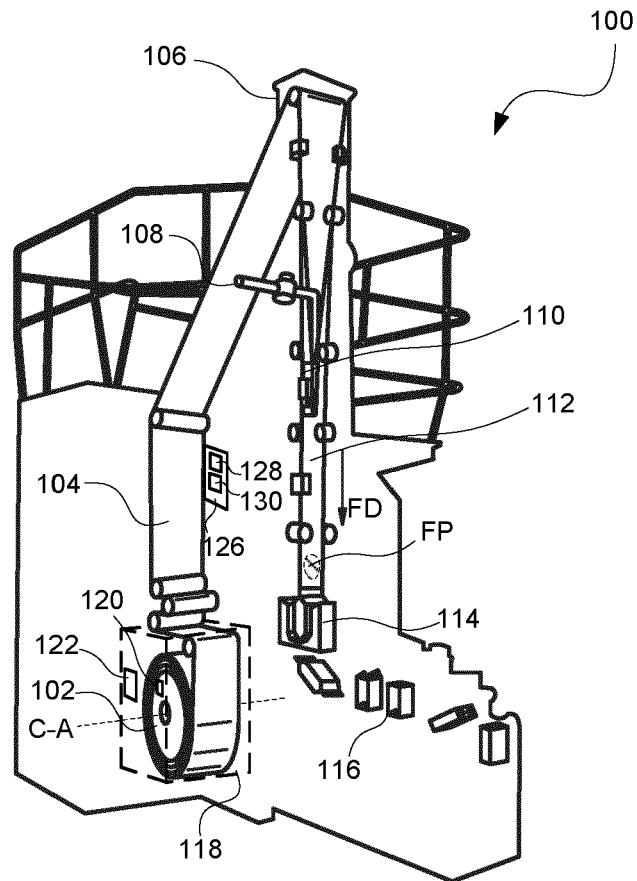


Fig. 1

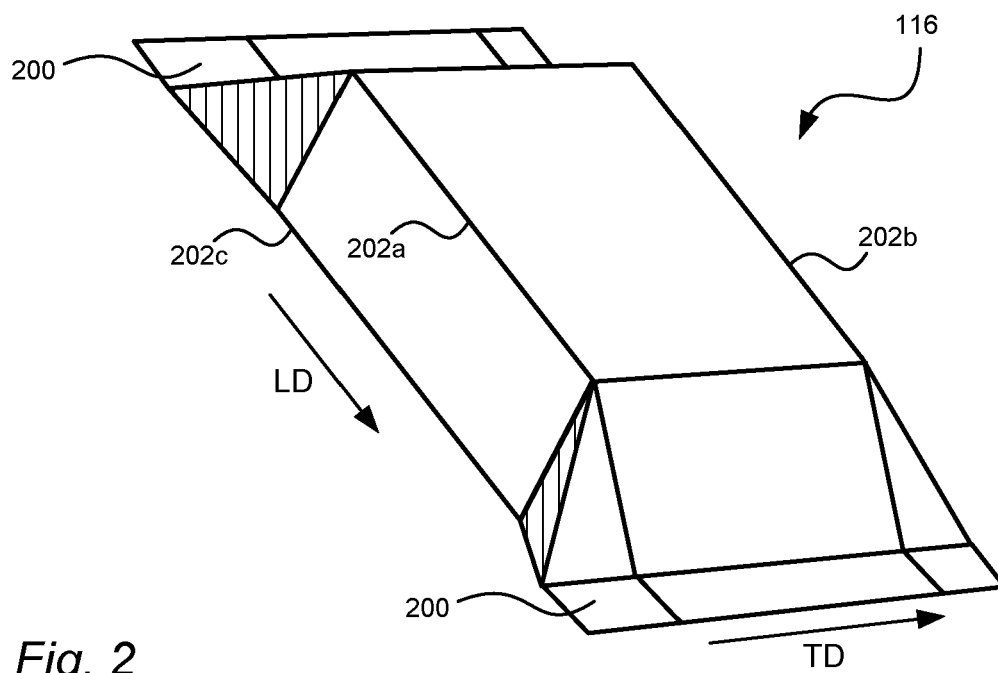
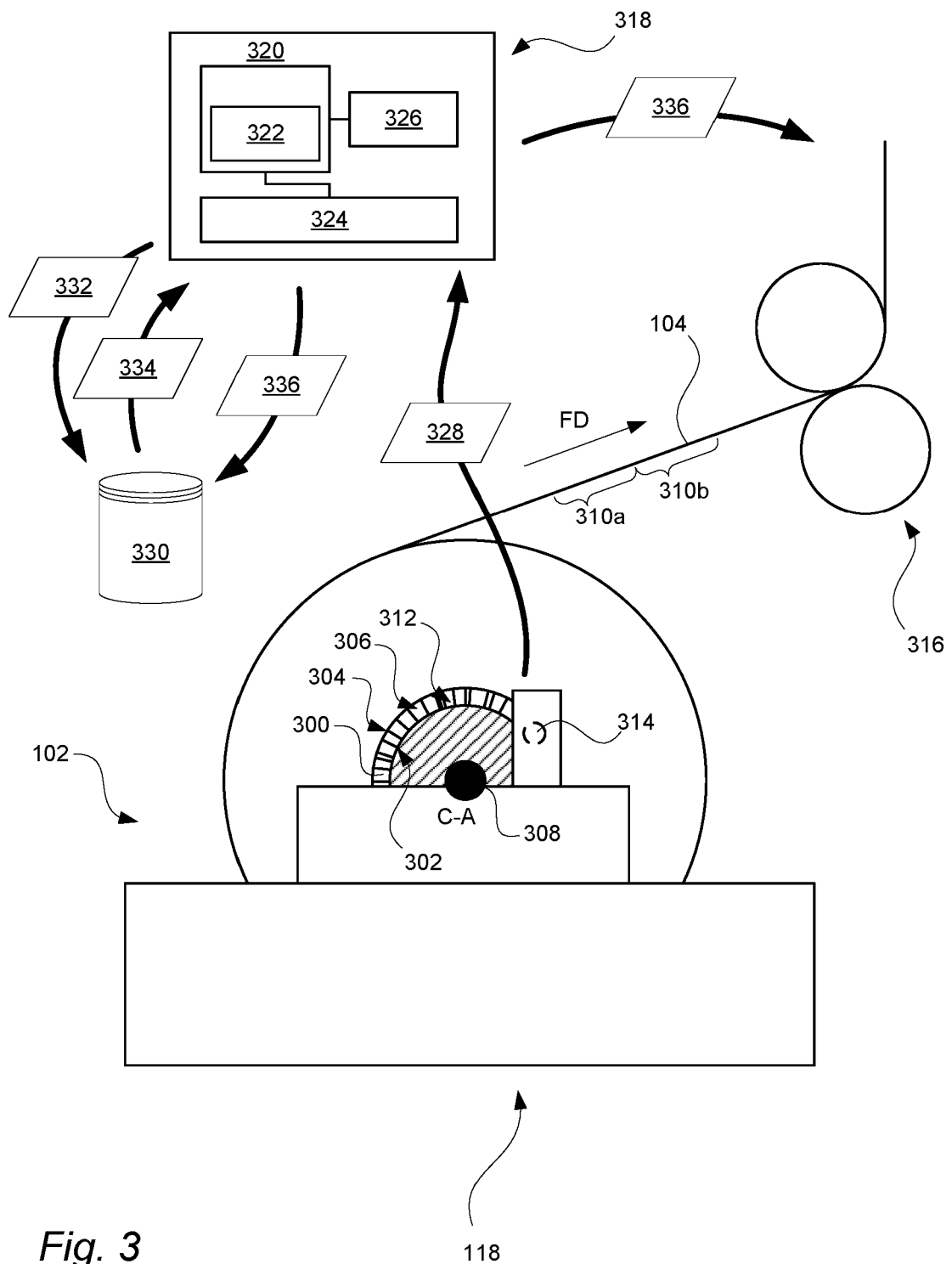
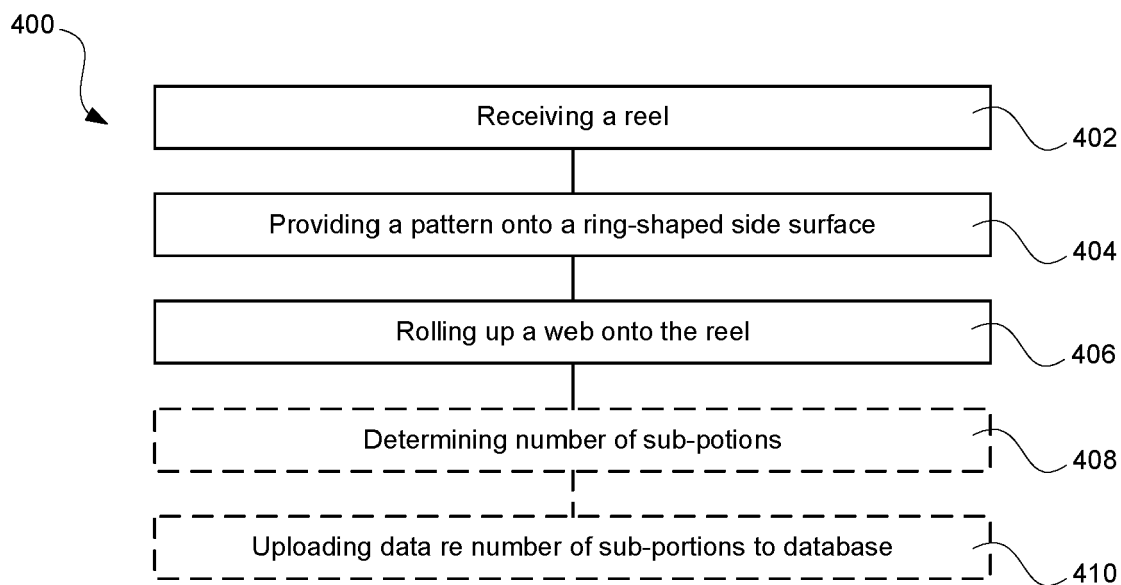
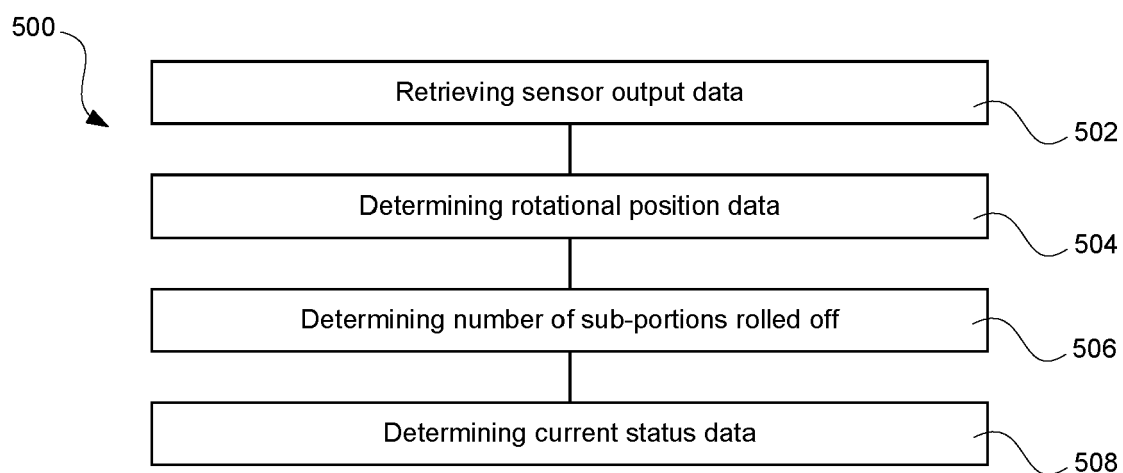


Fig. 2



*Fig. 4**Fig. 5*



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