(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 450 405 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.10.2024 Bulletin 2024/43

(21) Application number: **24168934.8**

(22) Date of filing: **08.04.2024**

(51) International Patent Classification (IPC):
B65B 9/20 *(2012.01)* ***B65B 41/16*** *(2006.01)*
B65B 41/18 *(2006.01)* ***B65B 51/14*** *(2006.01)*
B65B 57/04 *(2006.01)* ***B65B 57/12*** *(2006.01)*
B65B 65/00 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65B 9/213; B65B 9/20; B65B 41/16; B65B 41/18; B65B 51/144; B65B 57/04; B65B 57/12; B65B 65/00

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

(30) Priority: **17.04.2023 IT 202300007410**

(71) Applicant: **Tetra Laval Holdings & Finance S.A.**
1009 Pully (CH)

(72) Inventor: **Digani, Andrea**
41123 Modena (IT)

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

(54) **A METHOD FOR ASSOCIATING MACHINE DATA TO A PACKAGE, AND A SYSTEM THEREOF**

(57) A method (500) for associating a machine data set (348) to a package (336, 340), said method (500) comprising
obtaining (502) ID mark data set (346) pertaining to an ID mark (312) of a section (311) of a web (306) of packaging material by using a web ID mark reader (310) arranged in a web ID reader position in a web path, wherein the web (306) comprises a number of consecutive sections (311), wherein at least a subset of the sections are provided with ID marks,
logging (504) a web ID registration time point linked to registering of the ID mark (312) using the web ID mark reader (310),
determining (506), based on web path settings of the packaging machine (302), a path distance between the web ID reader position and a station position of the station (308, 316, 318, 324, 328, 330, 338) and speed data of the web (306),
determining (508) a station time point in which the section (311) is handled by the station by using the path distance, the speed data and the web ID registration time point logged by the web ID mark reader (310),
linking (510) the machine data set (348) used at the station time point in the station with the ID mark data set (346) of the section (311), and
storing (512) the machine data set (348) and the ID mark data set (346) linked to the machine data set (348) in a database (344).

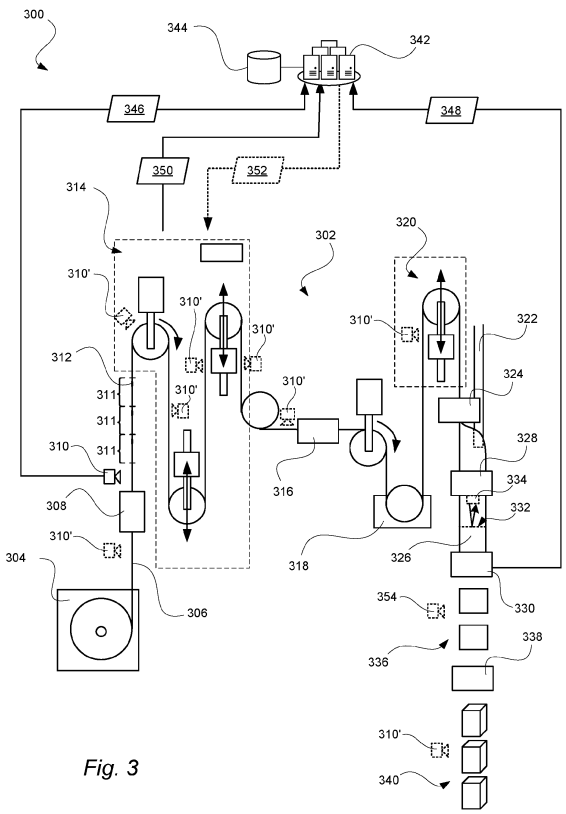

Fig. 3

EP 4 450 405 A1

Description

Technical Field

[0001] The invention relates to packaging technology, more particularly to improved control of roll-fed packaging machines.

Background Art

[0002] Today, it is well known to use roll-fed packaging machines for liquid food products. For instance, Tetra Brik® marketed by Tetra Pak® is a well-known package in the field produced in a roll-fed packaging machine. By using a roll-fed packaging machine, it is possible to use a renewable material, such as carton, as the main material of the packaging material. This comes with the advantage that the environmental impact can be reduced. Another advantage with roll-fed packaging machines in general is cost efficiency. By continuously producing packages from a tube filled with food product, it is namely possible to form packages at impressive speeds, and by reducing production time, the cost efficiency can be improved. Since the food product is held inside the tube, food safety can be assured in an efficient manner.

[0003] Even though roll-fed packaging machines are well-known, the general concept has been further developed during recent years. One improvement taking place is to provide more detailed data of the process taking place in the packaging machine. By having this detailed data, the process can be controlled more accurately such that, by way of example, parts of the machine that are starting to be worn out can be identified at an early stage such that these can be replaced in time, thereby avoiding a machine break down. By having more detailed data it is also possible to trace packages more closely. In this way packages of a certain batch can be identified in case for instance a potential food safety risk or quality issue has been linked to this batch.

[0004] There are different technologies developed for tracing packages in packaging machines. For instance, it has been suggested to use printed codes on packages, such as QR codes. Since these codes can be package specific, it is made possible to use these codes for identifying the packages. For instance, it is made possible to identify packages of the certain batch after the packages are distributed to end customers. By having information, such as from which farm the food product originates from, it is made possible to provide additional information about the food product to the end customer via the printed code on the package.

[0005] Even though it is known to use printed codes on the packages, as well as using RFID tags on the packages, there is a request for even better traceability within the packaging machine such that more detailed data can be provided.

Summary

[0006] 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 be able to provide more detailed data of the settings of the filling machine being used when producing a specific package. By making use of that the packaging material is provided as a web, that is, one continuous piece of packaging material, and that web path settings and web speed can be controlled in a precise manner, the different machine data sets used in different stations when producing the specific package can be determined by only using one web ID mark reader arranged to read an ID mark on the section of the web to be formed into the package.

[0007] According to a first aspect, it is provided a method for associating a machine data set to a package, wherein the machine data set comprises settings used in a station in a roll-fed packaging machine. The method may comprise obtaining an ID mark data set pertaining to an ID mark of a section of a web of packaging material by using a web ID mark reader arranged in a web ID reader position in a web path, wherein the web comprises a number of consecutive sections, wherein at least a subset of the sections are provided with ID marks, wherein each section is arranged to be formed into the package, logging a web ID registration time point linked to registering of the ID mark using the web ID mark reader, determining, based on web path settings of the packaging machine, a path distance between the web ID reader position and a station position of the station and speed data of the web, determining a station time point in which the section is handled by the station by using the path distance, the speed data and the web ID registration time point logged by the web ID mark reader, linking the machine data set used at the station time point in the station with the ID mark data set of the section, and storing the machine data set and the ID mark data set linked to the machine data set in a database.

[0008] By making use of that the web ID registration time point can be logged in a precise manner, and also that precise data for web path settings and web speed can be obtained, the station time point can be determined reliable. As an effect, only one web ID mark reader may be required to follow the section later on to be formed into the package in the roll-fed packaging machine. In addition to reduce the need of several web ID mark readers within the filling machine, it is also possible to determine the station time point even in cases when reading the ID mark may prove difficult due to the environment in the station. By way of example, reading the ID mark from a tube formed by the web may prove difficult. As a further example, it may prove difficult to read the ID mark in a sterilization station.

[0009] The roll-fed packaging machine may comprise a web buffering arrangement arranged to adjust a length of the web path, wherein the retrieving further comprising retrieving web buffering arrangement configuration data,

and the path distance is determined by taking the web buffering arrangement configuration data into account.

[0010] Using the web buffering arrangement may result in that the web path will vary over time and as an effect it may prove difficult to determine the station time point. However, by taking into account the web buffering arrangement configuration data, it is made known how the web buffering arrangement is operated at different time points, and by doing so the web path may be determined even though the web buffering arrangement is forming part of the packaging machine.

[0011] The packaging machine may be arranged to feed the web intermittently in the station.

[0012] One reason for having the web buffering arrangement is to provide for that the web can be moved with indexed movements, also referred to as intermittent movements, in some stations of the packaging machine. Examples of such stations are and injection molding station for applying opening devices onto the web, a hole puncher for punching holes in the web, and a pull-tab applicator for applying a pull-tab piece onto the punched out hole. By having the web path settings, including settings for the web buffering arrangements at different time points, the sections of the web can be followed, or traced, even though some of the stations require the web to move intermittently.

[0013] The station may be an injection molding station.

[0014] The station may be a transversal sealing station comprising a chain-based jaw system driven by a feed roller, and the machine data set may comprise degree of rotation of the feed roller per section of the web.

[0015] The process of making transversal sealings is to consider a key process in the roll-fed packaging machine. In case the transversal sealings are not adequately made, there is namely a risk that bacteria, spores, germs or unwanted microorganisms can find their way into the package and thereby spoil the food product held by the package. By being able to determine the station time point, that is, when the section will occur in the transversal sealing station, in a precise manner comes with the advantage that the settings used when producing the specific package can be determined in a precise manner. For instance, the machine data set obtained based on the station time point may include the degree of rotation of the feed roller per section.

[0016] The machine data set may further comprise a product level in a tube of packing material placed upstream the transversal sealing station.

[0017] The machine data set may not only relate to settings of the station, but can also relate to parameters related to the operation of the station. For instance, for the transversal sealing station, the product level in the tube at the station time point, that is, the time point when the specific package is transversally sealed, may have an effect on the transversal sealings. Thus, by also taking this into account, more detailed data can be achieved, which may both benefit later quality assessment of the specific package as well as for generating improved control data for the filling machine.

[0018] The method may further comprise registering the ID mark in the station by using a station ID reader, logging a station registration time point linked to the registering of the ID mark using the station ID reader, identifying a deviation in time between the station registration time point and the station time point, and in case the deviation is above a threshold, generating calibration data to compensate for the deviation.

[0019] An advantage with having the station ID reader is that deviations may be detected such that these can be compensated for. Put differently, for systems that cannot at all times be controlled as precise as desired, the station ID reader may be used for detecting situations when there is a deviation and also compensate for this.

[0020] The station may be the transversal sealing station, and the station ID reader may be arranged to read the ID mark of the tube fed into the transversal sealing station and the calibration data may comprise information on how the degree of rotation of the feed roller per section of the web is to be adjusted.

[0021] By using the approach described above, it is possible to compensate for any deviation that may occur, and by doing so the risk of having the transversal sealings misplaced can be reduced.

[0022] The roll-fed packaging machine may comprise a web buffering arrangement placed downstream the web ID mark reader, and said method may further comprise transmitting the calibration data to the web buffering arrangement to compensate for the deviation identified by extending or shortening the web path.

[0023] An advantage to use the web buffering arrangement to compensate for the deviation is that the station time points downstream the web buffering arrangement do not need to be recalculated.

[0024] The method may further comprise registering the ID mark of the package formed from the section by using a package ID mark reader arranged in a package ID reader position, wherein the package ID reader position is placed downstream the transversal sealing section.

[0025] After the packages are formed in the transversal sealing station, the different sections are not formed from the same piece of packaging material and it is thus not possible to determine the station time points as it is upstream the transversal sealing station. By having the package ID mark reader downstream the transversal sealing station it is thus possible to link further data to the ID mark, e.g. package quality assessment data, also after the web is cut.

[0026] The method may further comprise identifying package properties of the package formed from the section, linking the package properties to the ID mark data set, and storing the package properties and the ID mark data set in the database.

[0027] An advantage with having also the packaging properties linked to the ID mark data set is that more reliable models for how different parameter settings in

the packaging machine may affect the packages being produced can be achieved.

[0028] According to a second aspect it is provided a system comprising a data processing apparatus and a database for associating a machine data set to a package, wherein the machine data set may comprise settings used in a station in a roll-fed packaging machine, wherein said data processing apparatus is arranged to obtain an ID mark data set pertaining to an ID mark of a section of a web of packaging material by using a web ID marker reader arranged in a web ID reader position in a web path in the packaging machine, wherein the web comprises a number of consecutive sections, wherein at least a subset of the sections is provided with ID marks, wherein each section is arranged to be formed into the package, to log a web ID registration time point linked to registering of the ID mark using the web ID mark reader, to determine, based on web path settings of the packaging machine, a path distance between the web ID reader position and a station position of the station and speed data of the web, to determine a station time point in which the section is handled by the station by using the path distance, the speed data and the web ID registration time point logged by the web ID mark reader, to link the machine data set used at the station time point in the station with the ID mark data set of the section, and to store the machine data set and the ID mark data set linked to the machine data set in the database.

[0029] The same features and advantages described above with respect to the first aspect also apply to this second aspect.

[0030] The roll-fed packaging machine may comprise a web buffering arrangement arranged to adjust a length of the web path, wherein the data processing apparatus may be further arranged to retrieve web buffering arrangement configuration data, and the path distance may be determined by taking the web buffering arrangement configuration data into account.

[0031] The station may be a transversal sealing station comprising a chain-based jaw system driven by a feed roller, and the machine data set may comprise degree of rotation of the feed roller per section of the web.

[0032] The machine data set may further comprise a product level in a tube of packing material placed upstream the transversal sealing station.

[0033] 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

[0034] 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 perspective view of a roll-fed packaging machine.

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

Fig. 3 illustrates a system comprising a roll-fed packaging machine.

Fig. 4 illustrates a transversal sealing station of the roll-fed packaging machine of fig. 3 in further detail.

Fig. 5 is a flowchart illustrating a method for associating a machine data set to a package.

Detailed Description

[0035] With reference to fig. 1, a roll-fed packaging machine 100 is illustrated by way of example. The packaging machine 100 may comprise a packaging material (PM) reel receiver 101 arranged to receive a reel 102 of packaging material, also referred to as PM reel. Once unwound from the reel 102, a web 104 is provided that can be fed from the PM reel receiver 101 throughout the packaging machine 100. In the example illustrated in fig. 1, the web 104 can be fed in a feeding direction FD to a sterilization station 106, such as a sterilization bath or a low voltage electron beam (LVEB) station. Downstream the sterilization station 106, a product filling pipe 108 and a longitudinal sealing (LS) station 110 may be provided. As illustrated, by having the LS station 110, the web 104 may be formed into a tube 112. The product filling pipe 108 may serve the purpose of filling food product (FP) into the tube 112 from above. In a lower end of the tube 112, a transversal sealing (TS) station 114 may be provided. In the TS station 114, the tube 112 can be formed into packages 116 by providing transversal sealings and cutting off the tube 112 in the transversal sealings.

[0036] To reduce the risk of errors and to make sure that switching from one type of packaging material to another can be made in a lenient way, the PM reel 102 may be equipped with a PM reel ID tag 120, such as an RFID tag. The PM reel ID tag 120 can be read by a PM reel ID reader 122 provided in the packaging machine 100. When having the information provided via the PM reel ID tag 120, the packaging machine 100 may obtain machine settings associated to this information from an external server and/or from a memory in the packaging machine 100. In a similar manner, the TS station 114 may comprise an anvil comprising an anvil ID tag (not illustrated). By having an anvil ID reader 124 provided in the packaging machine 100, the anvil ID tag can be read and the information fed from the tag to the packaging machine 100 as part of the reading process may be used for downloading settings adapted to the anvil from the external server and/or the memory of the packaging machine in a similar manner as for the information obtained via the PM reel tag 120. In addition to the PM reel and the anvil, other parts of the machine 100 may also be equipped with tags, QR codes or other ID marks such that settings of the machine 100 can be made more efficiently.

[0037] The information retrieved from the tags or other ID marks may be transferred to a control unit 126 provided with a processor 128 and the memory 130. In addition

to receiving the information, the control unit 126 may also be configured to transmit control data to different parts of the machine based on the retrieved information. The control unit may also be configured to retrieve information continuously during operation of the machine 100 from sensors placed in the machine to assure that the machine is performing as expected.

[0038] Fig. 2 generally illustrates the package 116 produced by the packaging machine 100 illustrated in fig. 1. After cutting the transversal sealing in half, an upper and a lower TS sealing section 200 can be provided, sometimes referred to as top fin and bottom fin. To facilitate folding of the package 116, it can be provided longitudinal crease lines 202a-c extending in longitudinal direction (LD) as well as transversal crease lines 204a-c extending in transversal direction (TD).

[0039] Fig. 3 generally illustrates a system 300 comprising a roll-fed packaging machine 302, which may share the features of the packaging machine 100 illustrated in fig. 1. However, in addition to the features illustrated in fig. 1 and described above, the system 300 may comprise features such that the web and/or packages can be traced within the packaging machine 302 in a more precise manner.

[0040] In line with the packaging machine 100 illustrated in fig. 1, the packaging machine 302 may comprise a PM reel receiver 304 arranged to receive the PM reel holding a web 306 of packaging material. To provide for that the packaging machine 302 can continue to run when the PM reel is replaced, an automatic splicing unit (ASU) 308 may be provided. By having the ASU 308, the web 306 of one PM reel can be attached to another web of another PM reel, thereby forming a transversal welding, also referred to a transversal sealing, avoiding any machine interruptions related to change of PM reel.

[0041] A web ID mark reader 310 may be arranged to read ID marks 312 on the web 306. As illustrated, the web 306 may be arranged in sections 311 and each section 311 may be provided with an ID mark 312, respectively. Further, each section 311 may be arranged to be folded into a package at a later stage, thereby resulting in that there is one ID mark 312 per package. It is however also possible to only have the ID marks 312 on a subset of the sections 311. For instance, the ID marks 312 can be provided on every second section 311.

[0042] By logging a web ID registration time point, i.e. a time point when the ID mark 312 is read by the web ID mark reader 310, this information in combination with speed data of the web and web path settings can be used for determining a station time point, that is, a time point when the section 311 linked to the ID mark 312 being read will be or has been in a station of the packaging machine 302. Put differently, by making use of that the packaging material is provided as the web 306, that the time points for when the ID marks 312 are read can be logged precisely, that positions of the web ID mark reader 310 and the station are known, and that the web path settings for specific time points can be obtained, it is made possible to determine when the section 311 will be handled by the station by reading the ID mark 312 at one position along the web path. Even though it is generally sufficient with the web ID mark reader 310, additional ID mark readers 310' may also be provided to compensate for any inaccuracies that may occur with respect to e.g. the web path settings.

[0043] The web path settings may include any settings related to web buffering arrangements 314, 320. As illustrated, the web buffering arrangement 314, 320 may be constituted in various ways. By way of example, as illustrated in fig. 3, a first web buffering arrangement 314 may comprise an arrangement comprising three rollers; one feed roller and two subsequently placed rollers that may be moved vertically such that the web path can be extended or reduced. A second web buffering arrangement 320 may, as illustrated, only comprise one roller that can be moved vertically such that the web path can be extended or reduced. There may be different reasons for having web buffering arrangements. For instance, the first web buffering arrangement 314 may be used for temporarily extending the web path when one PM reel is replaced by another. Further, the first and second web buffering arrangements 314, 320 may be used in combination to provide for that the web 306 is moved intermittently in an injection molding station, e.g. a direct injection molding concept (DIMC) station, that can be used for providing opening devices, or part of opening devices, onto the web 306. By having the web moving intermittently, sometimes referred to as index movement, in the injection molding station 316 comes with the advantage that molds of the injection molding station 316 are not required to move with the web 306 during a molding process. In addition, the web buffering arrangement 314, 320 may also be used for compensating for deviations occurring in one or a sub-set of the stations in the packaging machine 302.

[0044] Downstream the injection molding station 316, a sterilization station 318 may be provided. As illustrated, the sterilization station 318 may be a bath through which the web 306 is fed such that unwanted microorganisms are removed. Another option, even though not illustrated, is to use low-voltage electron beam (LVEB) for removing the unwanted microorganisms.

[0045] The web 306 may be formed into a tube 326 by using a longitudinal sealing (LS) station 324. Once having the tube 326 formed, a product filling pipe 322 may be used for filling food product into the tube from above.

[0046] To provide for that the tube 326 is correctly aligned before being fed into a transversal sealing (TS) station 330, a tube guiding station 328 may be provided. For instance, by having the tube guiding station 328, the tube 326 can be guided such that a LS sealing, provided in the LS station 324, is aligned with an inductor and an anvil of the TS station 330.

[0047] Since a product level 332 of the tube 326 may have an effect of on the operation of the TS station 330, a product level sensor 334 may be provided. Data ob-

tained via this sensor may be directly fed to the TS station 330 such that pressure, temperature and other parameters may be adapted accordingly, but the data may also be stored for later analysis. In addition to providing transversal sealings, the TS station 330 may also be arranged to cut the tube in a mid-section of the transversal sealings such that unfolded packages 336 are formed. These unfolded packages 336 may be fed into a packaging forming station 338, also referred to as a final folder, such that these may be formed into folded packages 340. In addition to folding, different parts of the packages may be glued together, e.g. top flaps may be glued onto side panels.

[0048] As indicated above with reference to the product level sensor 334, data from different stations of the packaging machine 302 may be obtained. The obtained data may be transmitted to a data processing apparatus 342, e.g. a server, and a database 344. These two may be shared among several packaging machines 302 or they may be used solely for one specific filling machine 302. However, by sharing data among several filling machines, improved artificial intelligence/machine learning (AI/ML) models can be achieved since larger data sets are available.

[0049] From the web ID mark reader 310, an ID mark data set 346 can be obtained. This data set may comprise a package-specific code that makes it possible to identify the package and/or the section. It may also comprise a web registration time point, i.e. a point of time when the ID mark was registered. Since this point of time can be determined in a precise manner and also since the web path settings, which may include a web buffering configuration data set, can be obtained, it is made possible to determine a path distance between a web ID reader position and a station position of a station in the filling machine. Once having this path distance determined, a station time point may be determined, that is, a time point when the section 311 linked to the ID mark 312 being read will be in the station placed at the path distance from the web ID reader position. Put differently, instead of tracing the sections 311 of web 306 by continuously registering the ID mark 312 along the web path, the ID mark 312 is registered and the web registration time point in combination with the path settings are used for determining when the section will occur or did occur in the station. It should be noted that the station does not necessarily need to be placed downstream the web ID reader position, even though this case is illustrated in fig. 3. Further, it should also be noted that the concept is not limited to that the path settings need to remain the same, but even if changes are made during a time period between the web registration time point and the station time point, these changes may be taken into account.

[0050] A positive effect of that the station time point can be determined is that machine data 348 used in the station at the station time point can be identified and linked to the ID mark data set 346. By doing so, it is not only possible to trace the sections 311 and, later on, packages 336, 340, but also capture the machine data set 348 used when producing the packages 336, 340.

[0051] As illustrated, the ID mark data set 346 and the machine data set 348 may be captured and transmitted to the data processing apparatus 342 and the database 344. In addition, the web path settings 350, which may include the web buffering configuration data set, may also be captured and transmitted to the data processing apparatus 342 and the database 344.

[0052] Optionally, a station ID reader 354 may also be provided to register the ID mark 312 in the station. In case a deviation is identified between a station registration time point, that is, when the ID mark 312 is registered by the station ID reader 354, and the station time point, that is, the time point determined based on the web ID registration time point, this may compensated for by that the data processing apparatus 342 transmit calibration data 352 to the packaging machine 302.

[0053] As discussed above, by using the web registration time point it can be determined when the section 311 will be or has been in any one of the stations of the packaging machine 302. A station that may be of particular interest in the packaging machine 302 is the TS station 330, which is illustrated by way of example in fig. 4. One reason why the TS station 330 may be of particular interest is that the packages are closed in this section, and in case the machine data set 348 is not correct, i.e. the settings are not properly adjusted, this may result in that package integrity is not sufficient. As illustrated in fig. 4, a chain-based jaw system 400 can be used. Having such system 400 and feed rollers 402, it is made possible for the jaws to follow the tube 326 as this moves in the feeding direction (FD), thereby providing sufficient time for sealing together the tube 326. Once having sealed together the tube, this may be cut by using a knife 404 such that the unfolded packages 336 are provided. As illustrated, a first stage of a process taking place in the TS station 330 may be referred to as a sealing state (S) and a subsequent stage may be referred to as a cutting state (C).

[0054] For the situation illustrated in fig. 4, that is, the station to which the machine data set 348 is to be linked is the TS station 330, the machine data 348 may comprise a degree of rotation α of the feed roller 402 per section 311 of the web 306.

[0055] Further, a package ID mark reader 406 may be provided downstream the TS station 330. Since the web 306 is not provided in one piece downstream the TS station 330, it is not possible in the same manner as upstream the TS station 330 to determine when in time the different sections 311 will appear in the different stations, but it could still be of interest to read the ID mark 312 and to link data, such as quality assessment data, to the ID mark data set 346. Such data may namely be of interest for providing links between package quality issues and the machine settings used when handling the sections 311 within the packaging machine 302, e.g. between the PM reel receiver 304 and the TS station 330.

[0056] As illustrated in fig. 4, the station ID reader 354 may be placed upstream the TS station 330. By having the station ID reader 354 placed close to the TS station, the web path between the web ID reader position and a station ID reader position is extended up to a point just before the web 306 is cut in pieces. By doing so, as an effect of having the web path extended, any deviation between the station time point being determined based on the web ID registration time point and the actual station time point can be detected more easily.

[0057] Fig. 5 is a flowchart illustrating a method 500 for associating the machine data set 348 to the package 336, 340, wherein the machine data set 348 comprises settings used in the station 308, 316, 318, 324, 328, 330, 338 in the roll-fed packaging machine 302. The method may comprise obtaining 502 an ID mark data set 346 pertaining to the ID mark 312 of the section 311 of the web 306 of packaging material by using the web ID mark reader 310 arranged in the web ID reader position in the web path. The web 306 may comprise a number of consecutive sections 311, wherein at least a subset of the sections are provided with ID marks, wherein each section 311 is arranged to be formed into the package 336, 340. Further, the method may comprise logging 504 the web ID registration time point linked to registering of the ID mark 312 using the web ID mark reader 310, determining 506, based on web path settings of the packaging machine 302, a path distance between the web ID reader position and the station position of the station 308, 316, 318, 324, 328, 330, 338 and speed data of the web 306, determining 508 the station time point in which the section 311 is handled by the station by using the path distance, the speed data and the web ID registration time point logged by the web ID mark reader 310, linking 510 the machine data set 348 used at the station time point in the station with the ID mark data set 346 of the section 311, and storing 512 the machine data set 348 and the ID mark data set 346 linked to the machine data set 348 in the database 344.

[0058] Optionally, the method 500 may further comprise registering 514 the ID mark 312 in the station by using the station ID reader 354, logging 516 the station registration time point linked to the registering of the ID mark 312 using the station ID reader 354, identifying 518 the deviation in time between the station registration time point and the station time point, and in case the deviation is above a threshold, generating 520 calibration data 352 to compensate for the deviation.

[0059] Optionally, the roll-fed packaging machine 302 may comprise the web buffering arrangement 314 placed downstream the web ID mark reader 310, and the method may further comprise transmitting 522 the calibration data 352 to the web buffering arrangement 314 to compensate for the deviation identified by extending or shortening the web path.

[0060] Further, optionally, the method 500 may comprise registering 524 the ID mark 312 of the package 336, 340 formed from the section by using a package ID mark reader 406 arranged in a package ID reader position, wherein the package ID reader position is placed downstream the transversal sealing section 330.

[0061] Still further, also optionally, the method may comprise identifying 526 package properties of the package 336, 340 formed from the section 311, linking 528 the package properties to the ID mark data set 346, and storing 530 the package properties and the ID mark data set in the database 344.

[0062] 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 method (500) for associating a machine data set (348) to a package (336, 340), wherein the machine data set (348) comprises settings used in a station (308, 316, 318, 324, 328, 330, 338) in a roll-fed packaging machine (302), said method (500) comprising

   obtaining (502) an ID mark data set (346) pertaining to an ID mark (312) of a section (311) of a web (306) of packaging material by using a web ID mark reader (310) arranged in a web ID reader position in a web path, wherein the web (306) comprises a number of consecutive sections (311), wherein at least a subset of the sections are provided with ID marks, wherein each section (311) is arranged to be formed into the package (336, 340),
   logging (504) a web ID registration time point linked to registering of the ID mark (312) using the web ID mark reader (310),
   determining (506), based on web path settings of the packaging machine (302), a path distance between the web ID reader position and a station position of the station (308, 316, 318, 324, 328, 330, 338) and speed data of the web (306),
   determining (508) a station time point in which the section (311) is handled by the station by using the path distance, the speed data and the web ID registration time point logged by the web ID mark reader (310),
   linking (510) the machine data set (348) used at the station time point in the station with the ID mark data set (346) of the section (311), and
   storing (512) the machine data set (348) and the ID mark data set (346) linked to the machine data set (348) in a database (344).

2. The method according to claim 1, wherein the roll-fed packaging machine (302) comprises a web buffering arrangement (314) arranged to adjust a length

of the web path, wherein the retrieving further comprising retrieving web buffering arrangement configuration data, and the path distance is determined by taking the web buffering arrangement configuration data into account.

3. The method according to claim 2, wherein the packaging machine (302) is arranged to feed the web (306) intermittently in the station.

4. The method according to claim 3, wherein the station is an injection molding
station.

5. The method according to any one of the preceding claims, wherein the station is a transversal sealing station (330) comprising a chain-based jaw system (400) driven by a feed roller (402), and the machine data set (348) comprises degree of rotation (α) of the feed roller (402) per section (311) of the web (306).

6. The method according to claim 5, wherein the machine data set (348) further comprising a product level (332) in a tube (326) of packing material placed upstream the transversal sealing station (330).

7. The method according to any one of the preceding claims, further comprising

registering (514) the ID mark (312) in the station by using a station ID reader (354),
logging (516) a station registration time point linked to the registering of the ID mark (312) using the station ID reader (354),
identifying (518) a deviation in time between the station registration time point and the station time point, and
in case the deviation is above a threshold, generating (520) calibration data (352) to compensate for the deviation.

8. The method (500) according to claim 7, wherein the station is the transversal sealing station (330), the station ID reader (354) is arranged to read the ID mark (312) of the tube (326) fed into the transversal sealing station (330) and the calibration data (352) comprises information on how the degree of rotation (α) of the feed roller (402) per section (311) of the web (306) is to be adjusted.

9. The method (500) according to claim 7, wherein the roll-fed packaging machine (302) comprises a web buffering arrangement (314) placed downstream the web ID mark reader (310), said method further comprising
transmitting (522) the calibration data (352) to the web buffering arrangement (314) to compensate for the deviation identified by extending or shortening the web path.

10. The method (500) according to any one of the preceding claims, further
registering (524) the ID mark (312) of the package (336, 340) formed from the section by using a package ID mark reader (406) arranged in a package ID reader position, wherein the package ID reader position is placed downstream the transversal sealing section (330).

11. The method (500) according to claim 10, further comprising

identifying (526) package properties of the package (336, 340) formed from the section (311),
linking (528) the package properties to the ID mark data set (346), and
storing (530) the package properties and the ID mark data set in the database (344).

12. A system (300) comprising a data processing apparatus (342) and a database (344) for associating a machine data set (348) to a package (336, 340), wherein the machine data set (348) comprises settings used in a station (308, 316, 318, 324, 328, 330, 338) in a roll-fed packaging machine (302), wherein said data processing apparatus (342) is arranged to

obtain an ID mark data set (346) pertaining to an ID mark (312) of a section (311) of a web (306) of packaging material by using a web ID marker reader (310) arranged in a web ID reader position in a web path in the packaging machine (302), wherein the web (306) comprises a number of consecutive sections (311), wherein at least a subset of the sections is provided with ID marks, wherein each section (311) is arranged to be formed into the package (336, 340),
log a web ID registration time point linked to registering of the ID mark (312) using the web ID mark reader (310),
determine, based on web path settings (350) of the packaging machine (302), a path distance between the web ID reader position and a station position of the station and speed data of the web (306),
determine a station time point in which the section (311) is handled by the station by using the path distance, the speed data and the web ID registration time point logged by the web ID mark reader (310),
link the machine data set (348) used at the station time point in the station with the ID mark data set (346) of the section (311), and
store the machine data set (348) and the ID mark data set (311) linked to the machine data set

(348) in the database (344).

13. The system according to claim 12, wherein the roll-fed packaging machine (302) comprises a web buffering arrangement (314) arranged to adjust a length of the web path, wherein the data processing apparatus (342) is further arranged to retrieve web buffering arrangement configuration data, and the path distance is determined by taking the web buffering arrangement configuration data into account.

14. The system according to claim 12 or 13, wherein the station is a transversal sealing station (330) comprising a chain-based jaw system (400) driven by a feed roller (402), and the machine data set (348) comprises degree of rotation (α) of the feed roller (402) per section (311) of the web (306).

15. The system according to claim 14, wherein the machine data set (38) further comprises a product level (332) in a tube (326) of packing material placed upstream the transversal sealing station (330).

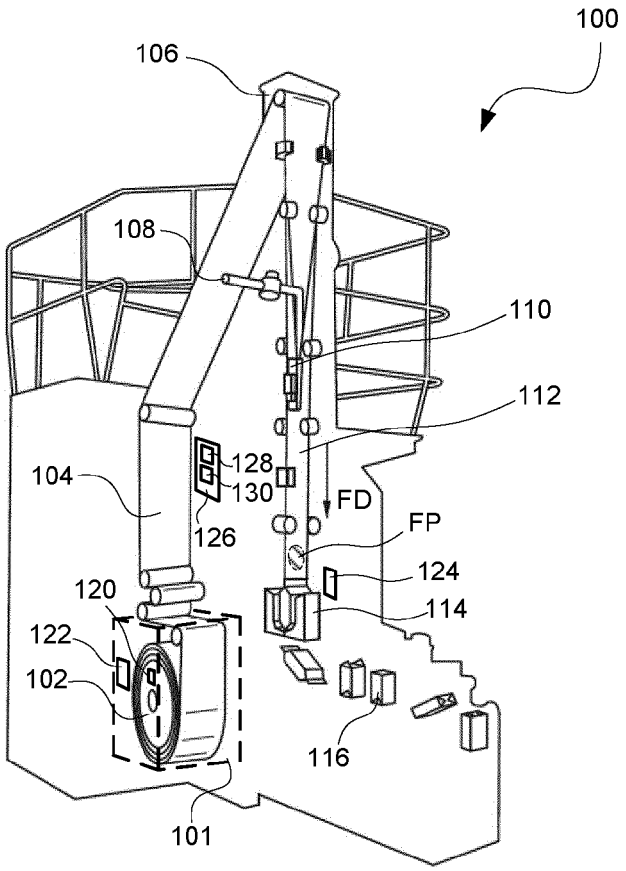
100
106
108
110
112
104
128
130
126
FD
FP
124
120
114
122
102
116
101

Fig. 1

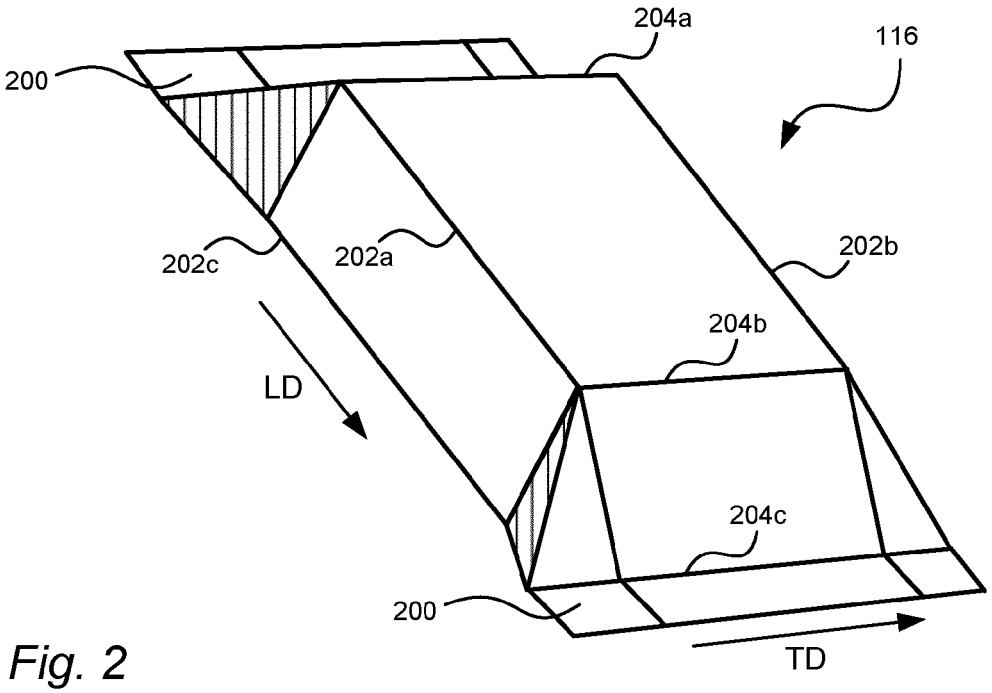
204a
116
200
202c
202a
202b
204b
LD
204c
200
TD

Fig. 2

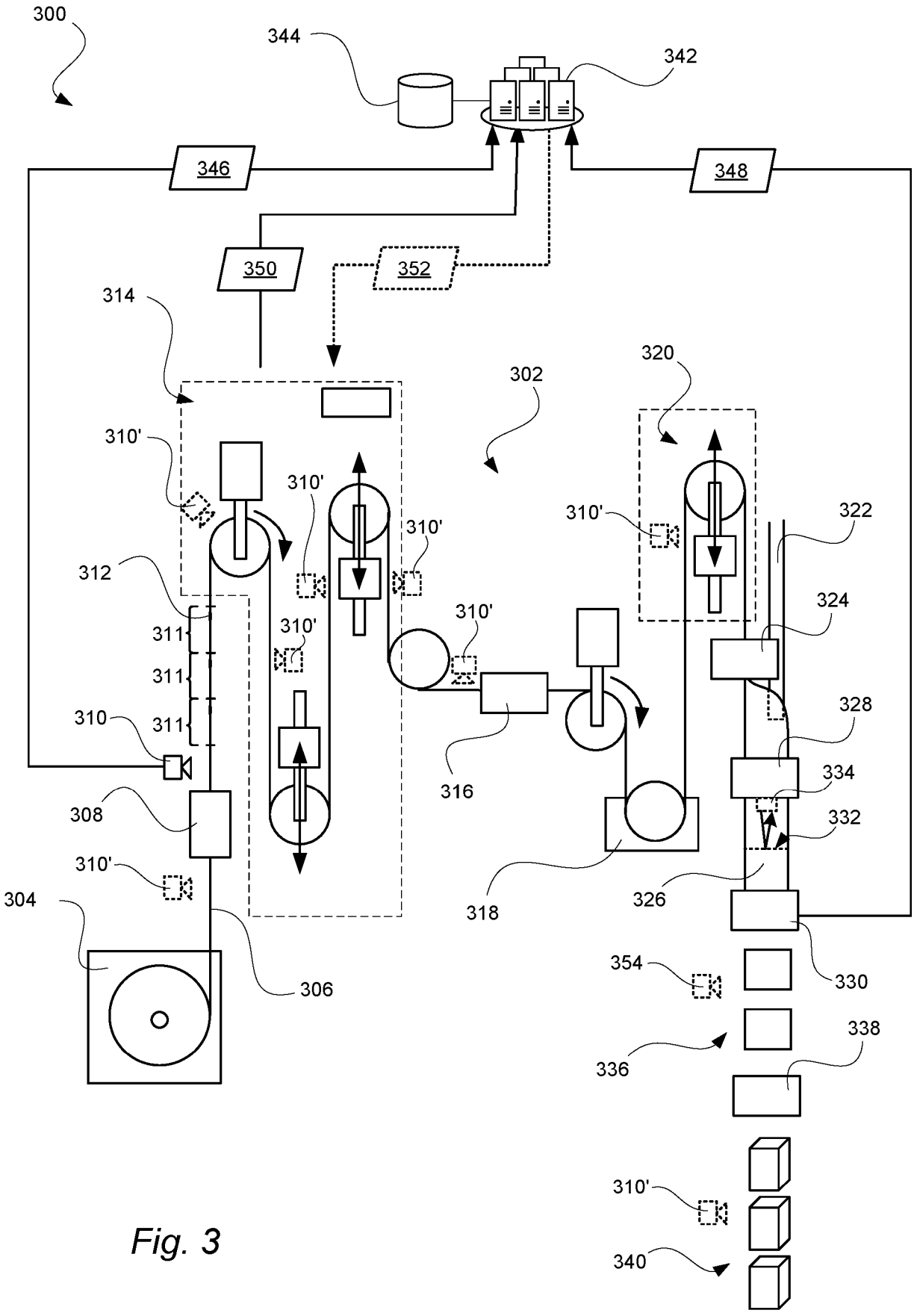
300
344
342
346
348
350
352
314
302
320
310'
322
312
324
311
328
310
334
308
332
304
326
306
330
354
338
336
340

Fig. 3

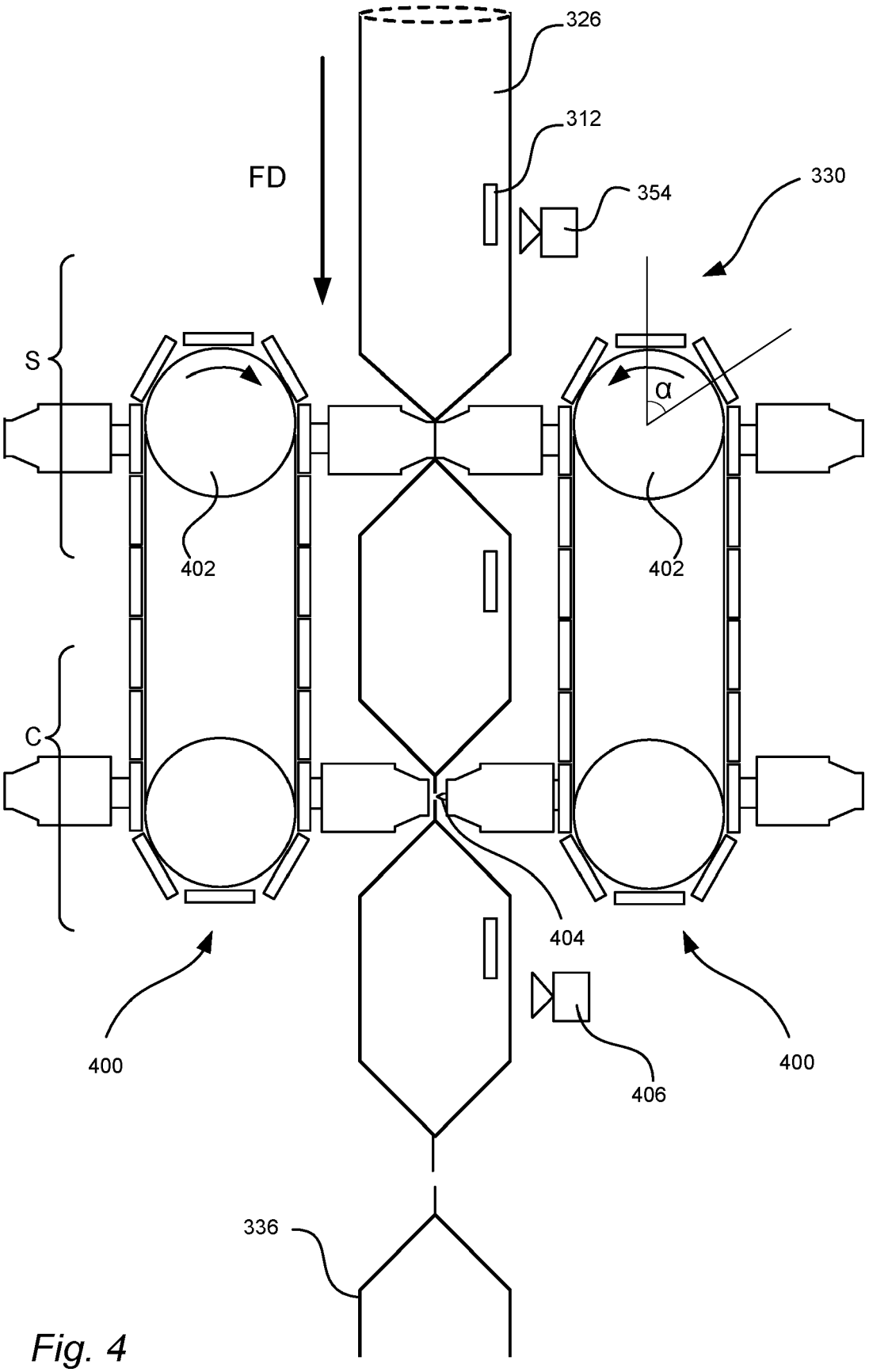

Fig. 4

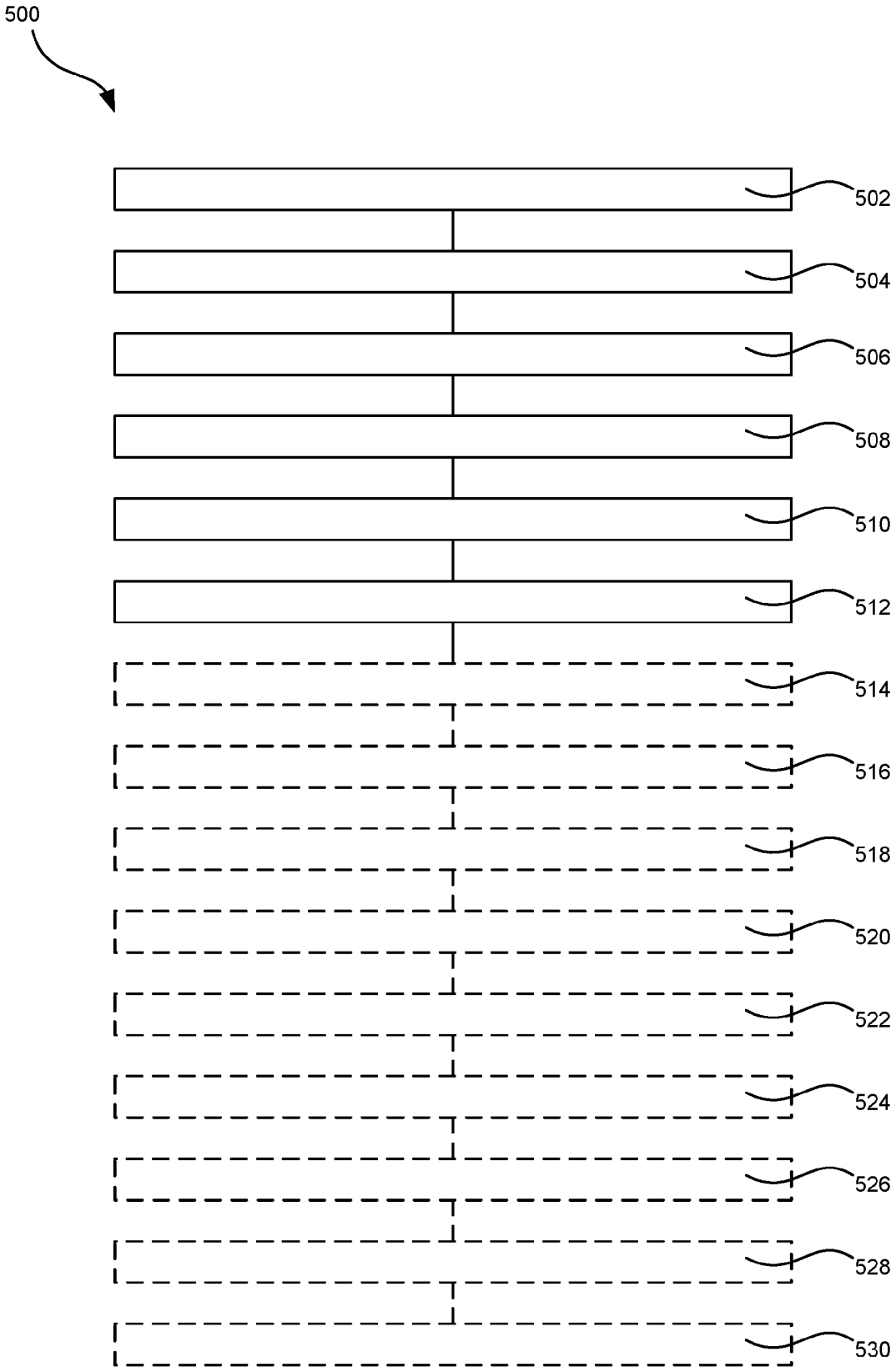

Fig. 5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 24 16 8934

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 6 088 994 A (NAKAGAWA YUKIO [JP] ET AL) 18 July 2000 (2000-07-18) * column 3, line 60 - column 10, line 58; figures 1-10 * -----	1,4-8, 12,14,15 2,3, 9-11,13	INV. B65B9/20 B65B41/16 B65B41/18 B65B51/14
Y	US 4 965 986 A (KLINKEL WOLFGANG [CH]) 30 October 1990 (1990-10-30) * column 4, line 59 - column 5, line 46 * -----	2,3,9,13	B65B57/04 B65B57/12 B65B65/00
Y	EP 0 761 546 A1 (SHIKOKU KAKOKI CO LTD [JP]) 12 March 1997 (1997-03-12) * column 3, line 11 - column 4, line 57; figures 1-4 * -----	10,11	

TECHNICAL FIELDS SEARCHED (IPC)
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 June 2024	Kelliher, Cormac

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
.....
& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 16 8934

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

28-06-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6088994 A	18-07-2000	US 6088994 A	18-07-2000
		US 6408599 B1	25-06-2002
		US 2003074865 A1	24-04-2003
US 4965986 A	30-10-1990	AU 621631 B2	19-03-1992
		CA 1314002 C	02-03-1993
		EP 0350617 A2	17-01-1990
		JP H02152610 A	12-06-1990
		US 4965986 A	30-10-1990
EP 0761546 A1	12-03-1997	DE 69603421 T2	05-01-2000
		DK 0761546 T3	29-11-1999
		EP 0761546 A1	12-03-1997
		JP 4096112 B2	04-06-2008
		JP H0977021 A	25-03-1997
		US 5756979 A	26-05-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82