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(54) MACHINE AND METHOD FOR PACKAGING POURABLE FOOD PRODUCTS IN SEALED CONTAINERS FORMED FROM A TUBE OF PACKAGING MATERIAL

MASCHINE UND VERFAHREN ZUM VERPACKEN VON FLIESSFÄHIGEN NAHRUNGSMITTELPRODUKTEN IN VERSIEGELTEN BEHÄLTERN AUS SCHLAUCHFÖRMIGEM VERPACKUNGSMATERIAL

MACHINE ET PROCÉDÉ D'EMBALLAGE DE PRODUITS ALIMENTAIRES VERSABLES DANS DES RÉCIPIENTS HERMÉTIQUES FORMÉS À PARTIR D'UN TUBE DE MATÉRIAU D'EMBALLAGE

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EP 3 075 669 B1

Description

[0001] This invention relates to a machine for packaging pourable food products in sealed containers formed from a continuous web of packaging material.

[0002] In a further aspect of it, this invention relates to a method for packaging pourable food products in sealed containers formed from a continuous web of packaging material.

[0003] The invention can be advantageously applied to the production of sealed containers for liquid or pourable food products where the packaging material which this description expressly refers to but without losing in generality, is a multilayer laminated material comprising at least one layer of paper, a thermoplastic layer and a layer of aluminium.

[0004] The invention can also be advantageously applied to the production of sealed containers for liquid or pourable food products where the packaging material does not have the layer of aluminium.

[0005] Pourable food products such as milk, fruit juices and tomato sauces can be packaged in sealed containers. Typically, these containers have the shape of a parallelepiped and are obtained from a web of packaging material which is first formed into a tube and then filled, sealed and completed according to the required shape.

[0006] It is common practice to use a packaging material with a multilayer structure comprising a substrate layer, typically of paper or paperboard, coated on the side that will form the inside of the container with a layer of oxygen barrier material such as aluminium.

[0007] The aluminium-paper laminate thus formed is then coated on both sides with heat-sealable plastic material, for example polyethylene. In other embodiments, the multilayer packaging material might be without the aluminium layer.

[0008] Containers of the above mentioned kind are made in a packaging machine, also of known type, where the packaging material is stored on suitable rolls which are unwound to feed a web of the packaging material along consecutive operating units making up the packaging machine.

[0009] The web is unwound following an unwinding direction along which it is first sterilized - for example by dipping in chemical sterilizing solutions such as a hydrogen peroxide bath - and then folded and sealed longitudinally to form the wrapping material into a continuous tube. Once the tube has been formed and while it continues moving along the production line, the tube is filled with the pourable or liquid product to be packaged. The filled tube is then sealed along portions of it transverse to the longitudinal axis of the tube itself so that, as it moves, the bottom of it is sealed and the filled and sealed wrappers can be cut off in succession.

[0010] The filled and sealed wrappers thus obtained thus have a typical pillow shape, that is to say, each wrapper is defined by a longitudinal seal and two transverse seals opposite each other. These wrappers are subjected to further processes by means of a folding unit which gives the sealed packages their final shape and allows them to be completed. The folding unit allows folding the fins defined by the heat-sealed portions of the wrapping material and folding the wrapper along the lines of weakness made along the web of packaging material to obtain a container having the shape of a parallelepiped or other required shape. Such a packaging machine is known from US 4034537. In prior art packaging machines, however, the layout of the operating units, although it allows the containers to be made at high speed, leads to maintenance requirements which are particularly onerous in terms of time and cost. The time and cost required for the maintenance of the forming unit are particularly high. In effect, the forming unit is subject to wear due to the continuous motion and stresses involved in the sealing and cutting operations, as well as wear due to residues of sterilizer not completely removed from the web being processed.

[0011] Further, the packaging flow traditionally used is not ergonomic and applies considerable stress and strain on the operator, who is required to perform complex and time-consuming operations on the machine.

[0012] This invention has for an aim to provide a machine which can package pourable food products in sealed containers formed from a continuous web of packaging material and whose maintenance requirements in terms of time and cost are reduced..

[0013] A further aim of the invention is to provide a machine for packaging pourable food products and whose footprint is limited compared to traditional machines.

[0014] Another aim of the invention is to provide a machine for packaging pourable food products and whose operating units are arranged in such a way as to be ergonomic for the operator performing the necessary maintenance operations.

[0015] Yet another aim of this invention is to provide a method for packaging pourable food products in sealed containers formed from a continuous web of packaging material.

[0016] This invention accordingly provides a machine and a method for packaging pourable food products in sealed containers as described in the accompanying claims.

[0017] The invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment of it and in which:

- Figure 1 is a perspective view of a packaging machine according to this invention;
- Figure 2 is a side plan view of the packaging machine of Figure 1;
- Figure 3 is a front plan view of the packaging machine of Figure 1;

[0018] The numeral 10 in Figures 1-3 denotes in its entirety a container for pourable food products. The con-

tainer 10 is obtained from a web 1 of wrapping material defined by a laminated multilayer structure comprising a substrate layer, of paper or paperboard, an oxygen barrier layer, of aluminium, and three thermoplastic layers, one of which is interposed between the paper layer and the aluminium layer and adapted to allow the mutual coupling thereof and the other two are adapted to coat the uncovered sides of the paper and aluminium layers, respectively. The container 10 comprises a parallelepiped shaped body having two opposite ends, a top end and a bottom end.

[0019] Each of the ends is provided with a transverse seal obtained by heat sealing two opposite walls of the web 1 wrapped into the shape of a tube 11, thereby forming respective transverse sealing tabs. The two ends are further connected by a longitudinal seal made during the formation of the tube 11 and a defining a further, longitudinal sealing tab. Each end portion protrudes from the parallelepiped shaped body section, with triangular flaps designed to be folded flat against the body by the folding unit, as described in detail below.

[0020] The product inside the container 10 is of a pourable type, for example in the form of powder, granules, leaves or liquid or semiliquid. In the embodiment described below, the container 10 contains fruit juice, hence in liquid form.

[0021] The numeral 100 in Figures 1-3 denotes in its entirety a packaging machine according to this invention for packaging pourable food products in the above mentioned containers 10. The packaging machine 100 which makes containers 10 comprises an unwinding unit 110 for unwinding the web 1 of laminated multilayer material from a roll 1'. The web 1 is unwound along a feeding direction MD of the web 1 along the packaging machine 100 by means of customary guide roller devices (not illustrated). The feeding direction MD runs from the rear end of the machine 100, where the rolls 1' are, to the front end of it, where the tube 11 is. Thus, the feeding direction is substantially horizontal to the floor even if the web 1 is fed to the units in succession following a path which is not rectilinear. More specifically, the web 1 is fed both along horizontal and vertical stretches not only to optimize the space occupied by the packaging machine 100 but also to keep the web 1 suitably tensioned along the wrapping path as a whole.

[0022] In unwinding the web 1 a buffer portion 160 is defined by means of a plurality of return rollers (not illustrated). This makes it possible not to interrupt machine operation when a roll is changed.

[0023] Similarly, the buffer 160 allows adapting the speed of feeding the web 1 to the speed of filling the tube 11 formed, compensating the macro oscillations in the packaging flow. In such case, a second buffer 161 provided in the proximity of the section where the tube 11 is formed allows adapting the speed of the web 1 to the speed at which the tube 11 is formed and fed.

[0024] At the portion of the packaging machine 100 occupied by the buffer 160, there is a unit 170 for feeding a tape 12 along the longitudinal edges of the web 1. The tape 12 subsequently allows the tube 11 to be sealed longitudinally after it has been formed, downstream of the sterilization unit.

[0025] The wrapping path thus extends towards the sterilization unit 120 which sterilizes the web 1 being unwound. The sterilization unit 120 comprises a tank for dipping the web 1 in a hydrogen peroxide solution, followed by a sterile chamber placed in fluid communication with the tank.

[0026] A subsequent portion of the packaging machine 100 is provided with one or more drying devices which convey the web 1 to the front portion of the packaging machine 100 itself.

[0027] The unwinding unit 110, the sterilization unit 120 and the longitudinal sealing unit 130 are consecutively positioned along the feeding direction MD of the web 1. More specifically, the consecutive layout does not involve a successive arrangement of the above mentioned units along a rectilinear axis but only the feeding direction of the packaging flow along the units, the packaging flow passing through each of the units in sequence from the rear end to the front end of the packaging machine 100.

[0028] At the front end portion and extending vertically in succession along a sliding direction SD of the tube 11 are a longitudinal sealing unit 130 for longitudinally sealing the sterilized web 1 and adapted to form a continuous tube 11 of packaging material, and a filling unit adapted to feed the pourable food product into the continuous tube 11 formed.

[0029] More specifically, the filling unit (not illustrated) is inserted into the tube 11 being formed before the longitudinal sealing unit 130 and extends into the same for a stretch such that it operatively follows the sealing unit 130.

[0030] Lastly, a forming unit 140 is located downstream of the final stretch of the filling unit and allows sealing the bottom of the tube 11 formed and cyclically cutting off the sealed wrappers 10' filled with the pourable product. With reference to Figures 1, 2 and 3, the sliding direction of the tube 11 from the sealing unit 130 to the filling unit and to the forming unit 140 is perpendicular to the floor (that is, to the ground), that is to say, the sealing unit 130, the filling unit and the forming unit 140 are vertically aligned with each other. That means the overall dimensions of the machine 100 can be particularly limited, for example compared to the case where the sliding direction of tube is oblique to the floor.

[0031] The forming unit 140 is defined by two pairs of jaws which cyclically interact with the continuously moving tube 11. These allow heat sealing the bottom portion of the tube 11, so as to prevent loss of the pourable food product while it is being filled, and separating the wrappers filled with the correct quantity of product by sealing the bottom of the moving tube 11 again after the completed sealed wrapper 10' is cut off. The forming unit 140 thus defines wrappers 10' which are filled and sealed and pillow-shaped, that is to say, each wrapper 10' is defined

by a front wall and a rear wall, where a longitudinal seal extends along one of these two walls and two opposite transverse seals delimit the upper and lower portions of the walls.

[0032] In a further embodiment (not illustrated), the forming unit may be provided with two distinct means operating on the moving tube. More specifically, first heat sealing means, for example two pairs of jaws which cyclically interact with the continuously moving tube, allow sealing the bottom of the tube formed and, cyclically, also sealing a portion upstream of the bottom at a predetermined spacing, thus obtaining a moving tube containing isolated portions of pourable food product. Next, second cutting means, for example a knife and the associated anvil or a pair of cutting rollers, allow separating the isolated portions of the moving tube at the predetermined spacing to obtain respective sealed wrappers filled with the pourable product.

[0033] These wrappers 10' must be further manipulated to complete their forming process so as to obtain the required sealed package 10. A folding unit 150 is located downstream of the forming unit 140 and is adapted to complete the forming of the filled and sealed wrappers 10' into sealed containers 10 of the desired shape. In the embodiment illustrated, the folding unit 150 is a conveying star wheel provided with a plurality of housings adapted to hold and move the wrappers 10' along the folding path defined by the star wheel itself. Along the circular conveying path, the star wheel comprises at least one heating device and at least one folding device. The heating device allows heating the portions of the wrapper 10' to be folded in such a way as to bring the thermoplastic layer of the portions concerned to the required temperature. The folding device, on the other hand, allows forming the walls of the container 10 according to the lines of weakness made on the web 1 of wrapping material and/or folding the heated portions to cause them to adhere to the body of the container 10.

[0034] More specifically, the folding unit 150 is located between the forming unit 140 and the unwinding unit 110. That way, the front end of the packaging machine 100, at the tube 11, is completely free and thus easy to access for maintenance or other purposes. According to this invention, unlike prior art packaging machines 100, the folding unit 150 is located within the footprint of the packaging machine 100 and, in particular in the area between the forming unit 140 and the unwinding unit 110.

[0035] The folding unit 150 is arranged in a direction opposite to the feeding direction MD of the web 1, forming an open loop packaging flow.

[0036] More specifically, the folding unit 150 moves the filled and sealed wrappers 10' in the direction opposite to the feeding direction of the web 1. This is done by causing the star wheel to rotate in the direction opposite to the feeding direction of the web 1. In the embodiment illustrated, this feed motion is accomplished by driving the star wheel clockwise since the web 1 moves from right to left.

[0037] The sealed wrappers 10' are fed by the forming unit 140 to the folding unit 150 by suitable feeding means 151 the packaging machine 100 is equipped with. In the embodiment illustrated, the feeding means 151 comprise an endless conveyor belt trained around a group of pulleys. These move the conveyor belt, and hence the feeding means 151, continuously and in the direction opposite to the feeding direction MD of the web 1. Thus, the clockwise movement of the conveyor belt allows feeding the filled and sealed wrappers 10' in the direction opposite to the feeding direction MD of the web 1 as far as the star wheel which forms part of the folding unit 150.

[0038] Downstream of the latter, there are suitable conveyor means 152 adapted to move the sealed containers 10 from the folding star wheel to the outfeed zone of the packaging machine 100. More specifically, according to invention, the conveyor means 152 consist of a further conveyor belt which defines a path along which the containers are first extracted from the pocket of the wrapping star wheel when it is at the last position and then continuously fed out of the packaging machine 100. This conveyor belt moves the sealed containers 10 parallel to the feeding direction MD of the web 1. More specifically, the conveyor belt extracts the sealed and formed containers 10 perpendicularly to the feeding direction MD of the web 1, causing them to follow a U shaped path within the area defined by the footprint of the machine and leading them onto an outfeed path parallel to the feeding direction MD of the web 1.

[0039] Advantageously, the fact that the containers 10 are fed out of the machine 100 in a direction parallel to the feeding direction MD of the web allows full access to the zone of the machine 100 along which the folding unit 150, the forming unit 140 and the unwinding unit 110 are located. Action to be taken for maintenance purpose and/or in the event of malfunctioning of the machine 100 (and, more specifically, of the folding unit 150, forming unit 140 or unwinding unit 110) is therefore made easier because it is easy for the operator to access the parts concerned.

[0040] To further reduce the machine footprint, the folding unit 150 is positioned under, and at, the sterilization unit 120. Positioning at the sterilization unit 120 means that the folding unit 150 is positioned within the area of the machine footprint corresponding or adjacent to the sterilization unit 120, hence comprising also movements limited to the portions adjacent to the selfsame sterilization unit 120. This allows the folding unit 150 to move the filled and sealed wrappers 10' in a flow which is superposed on and parallel to the feeding direction MD of the web 1 at the sterilization unit 120. More specifically, the sterilization unit 120 defines part of the packaging flow through movement of the web 1. The folding unit 150 defines part of the packaging flow through movement first of the sealed containers 10' and then of the completed containers 10. These two portions of the packaging flow are thus parallel and superposed, defining two branches of the open loop packaging path.

[0041] The layout of the units making up the packaging machine 100 allows provision of free access, that is, of a face that is completely free of other units, at the front of the machine where the longitudinal sealing unit, the filling unit and the forming unit are positioned in vertical succession. This minimizes the time, and hence the cost, needed to operate on these units because it is easy for the operator to access them and thus to take prompt action on any of these units when they require maintenance.

[0042] The structure of the packaging flow in the packaging machine 100 according to the invention also allows considerably reducing the footprint of the unit, thus offering further significant savings in costs connected with the production area occupied.

[0043] The packaging of pourable food products in containers 10 formed from a continuous web 1 of packaging material is thus defined.

[0044] In use, in a first unwinding step, the web 1 is unwound from a roll 1' along a feeding direction MD of the web 1 in a packaging machine 100 by means of the unwinding unit 110. Downstream of the buffer 170, the web 1 is coupled to the thermoplastic tape 12 along a longitudinal edge.

[0045] In a subsequent step, the unwound web 1 is subjected to sterilization by conveniently diverting the web 1, together with the tape 12, towards the sterilization unit 120 for sterilizing the unwound web 1.

[0046] Sterilization is accomplished by causing the web 1 to pass through the tank containing the hydrogen peroxide solution, thus dipping the web 1 in the solution which sterilizes it completely. The flow of the web 1 is then diverted into the sterile chamber located immediately downstream of, and in fluid communication with, the peroxide dip tank.

[0047] The sterilization fluid must then be removed completely from the web 1 before it comes into contact with the fruit juice to be packaged in order to prevent it from being contaminated by the peroxide. Air blades inside the sterile chamber direct high pressure air flows at the moving web 1, thereby drying it and, consequently removing the hydrogen peroxide in excess.

[0048] The sterilization step is followed by the step of forming the continuous tube 11 of packaging material by longitudinally sealing the sterilized web 1. The web is wrapped into the shape of a tube 11 about the longitudinal axis A of the tube itself, corresponding to the sliding direction SD of the tube 11 after being filled. Concurrently with this wrapping action, a heating device raises the temperature of the tape 12 so as to partly melt it to allow coupling of the two sides of the web 1 during wrapping along the longitudinal axis.

[0049] In a further embodiment (not illustrated) the longitudinal seal may be made on the unwrapped, opposing folded portions of the web so as to make it unnecessary to use the thermoplastic tape.

[0050] The tube 11 thus formed and in motion is then continuously filled with the pourable product by means of the filling unit the packaging machine 100 is equipped with. Filling of the tube 11 formed is continuous, like the continuous feed motion of the tube 11 formed.

[0051] The filling step is followed by the step of successively forming the filled and sealed wrappers 10' from the tube 11 along the sliding direction SD of the filled tube 11 itself. The two pairs of jaws forming part of the forming unit 140 cyclically interact with the continuously moving tube 11. These allow heat sealing the bottom portion of the tube 11, so as to prevent loss of the pourable food product while it is being filled. Also during the forming step, the two pairs of jaws cut the filled tube 11 along portions of it transverse to the longitudinal axis A of the tube 11. That way, the wrappers filled with the correct quantity of product are cyclically separated from the tube 11 and, at the same time, the bottom of the moving tube 11 is sealed again at the detached portion of the sealed wrapper 10'.

[0052] The conveyor belt of the feeding means 151 then feed the sealed wrappers 10' towards the folding star wheel defining the folding unit 150 continuously and in the direction opposite to the feeding direction MD of the web 1. In the next step of folding the sealed wrappers 10', the containers 10 are given their required final shape.

[0053] The folding unit 150 allows folding the fins defined by the heat-sealed portions of the wrapping material and folding the wrapper 10' along the lines of weakness made along the web 1 of packaging material to obtain a container having the shape of a parallelepiped or other required shape.

[0054] Based on the position of the folding unit 150 inside the area defining the footprint of the machine, between the forming unit 140 and the unwinding unit 110, the folding step is carried out while the sealed and filled wrappers 10' are moving in the direction opposite to the feeding direction MD of the web 1, thus forming an open loop packaging flow. More specifically, the folding step, forming part of the packaging flow, is carried out along a partially circular path defined by the folding star wheel of the folding unit 150. As the wrappers move along the circular path of the folding star wheel, the heating device allows heating the portions of the wrapper 10' to be folded in such a way as to bring the thermoplastic layer of the portions concerned to the required temperature. The folding device, on the other hand, allows forming the walls of the container 10 according to the lines of weakness made on the web 1 of wrapping material and/or folding the heated portions to cause them to adhere to the body of the container 10.

[0055] Lastly, the containers 10 are fed out of the packaging machine 100 by the conveyor means 152. More specifically, according to invention, the conveyor means 152 move the sealed containers 10 parallel to the feeding direction MD of the web 1 by means of a conveyor belt. More specifically, the conveyor belt extracts the sealed and formed containers 10 perpendicularly to the feeding direction MD of the web 1, causing them to follow a U shaped path within the area defined by the footprint of the machine and leading them onto an outfeed path par-

allel to the feeding direction MD of the web 1. The outfeed path runs in the same direction as the feeding direction MD of the web 1.

[0056] The packaging machine 100 may also be provided with accessory units such as, for example, units (not illustrated) for the coupling of caps, straws or pull tabs to the formed containers. These may be positioned along the conveyor belt path inside the area defined by the footprint of the machine. That way, the packaging flow keeps its typical open loop shape, leaving the front of the packaging machine free.

[0057] In the further embodiment (not illustrated) where the forming unit is provided with first heat sealing means and second cutting means which are distinct from each other, the steps of the packaging process are the same but with some variations in the forming step.

[0058] More specifically, the filling step is followed by the step of successively forming the filled and sealed wrappers from the tube along the sliding direction SD of the tube itself. The first heat sealing means, consisting for example, of two pairs of jaws, cyclically interact with the continuously moving tube. These allow heat sealing the bottom portion of the tube, so as to prevent loss of the pourable food product while it is being filled. The same pair of jaws also allows sealing a portion upstream of the bottom at a predetermined spacing, thus obtaining a moving tube containing isolated portions of pourable food product.

[0059] Further, in the forming step, the step of cutting the isolated portions of the moving tube at the predetermined spacing to obtain respective sealed wrappers filled with the pourable product is performed by second cutting means, for example consisting of a knife and the associated anvil, That way, the wrappers filled with the correct quantity of product are cyclically separated from the tube 11 sequentially but independently of the sealing operations carried out during the same forming step. The same results can be obtained in the case where the cutting means consist of a knife and the associated anvil mounted on a pair of cutting rollers between which the tube provided with the isolated portions of pourable food product is made to slide.

[0060] The packaging machine 100 which makes multilayer containers 10 as described above offers several advantages.

[0061] First of all, it allows attaining high hourly outputs, that is to say, high numbers of containers made per unit of time, while guaranteeing a consistently high standard of production quality. The layout of the folding unit and of the feeding and conveyor means, respectively, of the sealed wrappers and of the fully shaped containers, allow the machine to have an appreciably smaller footprint than prior art machines while maintaining the same production capacity.

[0062] Furthermore, the layout of the units making up an open loop packaging flow allows maximizing the use of the machine footprint and minimizing the costs connected with the production area occupied.

[0063] Moreover, the packaging machine described above allows ample room to move around each component, which facilitates both initial assembly and subsequent maintenance (from routine cleaning to substitution) of the components.

Claims

1. A packaging machine (100) for packaging pourable food products in containers (10) formed from a continuous web (1) of packaging material, said machine (100) comprises:

    - at least one unwinding unit (110) for unwinding said web (1) from a roll (1') along a feeding direction (MD) of said web (1) in said machine (100) which is substantially horizontal to the floor;
    - a longitudinal sealing unit (130) for sealing said web (1) longitudinally to form a continuous tube (11) of packaging material;
    - a filling unit adapted to feed said pourable food product into said continuous tube (11) formed;
    - a forming unit (140) adapted to seal said filled tube (11) along portions transverse to the longitudinal axis (A) of said tube (11) and to separate filled and sealed wrappers (10') in succession along a sliding direction (SD) of said filled tube (11);
    - a folding unit (150) positioned downstream of said forming unit (140) and adapted to complete the forming of said filled and sealed wrappers (10') into said sealed containers (10) according to the desired shape;

    said folding unit (150) being disposed between said forming unit (140) and said unwinding unit (110), within the footprint of said machine between said forming unit (140) and said unwinding unit (110);
    said machine (100) further comprises conveyor means (152) located downstream of said folding unit (150) and adapted to move said sealed containers (10) out from said machine (100); **characterized in that** it also comprises
    a sterilization unit (120) for sterilizing said unwound web (1);
    and **in that** said conveyor means (152) extract the sealed and formed containers (10) perpendicularly to the feeding direction (MD) of the web (1), causing them to follow a U shaped path within the area defined by the footprint of the machine and leading them onto an outfeed path parallel to the feeding direction (MD) of the web (1).

2. The packaging machine (100) according to claim 1, wherein said unwinding unit (110), sterilization unit (120) and longitudinal sealing unit (130) are consec-

utively positioned along said feeding direction (MD) of said web (1), wherein
said filling unit and forming unit (140) are consecutively arranged along said sliding direction (SD), and wherein
said folding unit (150) is arranged in a direction opposite to the feeding direction (MD) of said web (1), forming an open loop packaging flow.

3. The packaging machine (100) according to claim 1 or 2, wherein said folding unit (150) moves said filled and sealed wrappers (10') in a direction opposite to said feeding direction (MD) of said web (1).

4. The packaging machine (100) according to one or more of claims 1 to 3, wherein said folding unit (150) is positioned below and at said sterilization unit (120).

5. The packaging machine (100) according to one or more of claims 1 to 4, wherein said folding unit (150) moves said filled and sealed wrappers (10') in a flow superposed on, and parallel to, said feeding direction (MD) of said web (1) at said sterilization unit (120).

6. The packaging machine (100) according to one or more of claims 1 to 5, wherein said machine (100) comprises feeding means (151) for feeding said filled and sealed wrappers (10'), said feeding means (151) are interposed between, and operatively connected to, said forming unit (140) and said folding unit (150).

7. The packaging machine (100) according to claim 6, wherein said feeding means (151) move said filled and sealed wrappers (10') in a direction opposite to said feeding direction (MD) of said web (1).

8. A method for packaging pourable food products in containers (10) formed from a continuous web (1) of packaging material, said method comprises the steps of:

- unwinding said web (1) from a roll (1') along a feeding direction (MD) of said web (1) in a packaging machine (100) according to one of the claims 1 to 7,
- forming a continuous tube (11) of packaging material by longitudinally sealing said web (1);
- feeding said pourable food product into said continuous tube (11) formed;
- forming filled and sealed wrappers (10') in succession from said tube (11) along a sliding direction (SD) of said filled tube (11) by sealing and cutting said filled tube (11) along portions transverse to the longitudinal axis of said tube (11);
- folding said filled and sealed wrappers (10') according to a desired shape after said forming step, thus defining the shape of said filled containers (10);

said folding step being carried out while said filled and sealed wrappers (10') advance in a direction opposite to the feeding direction (MD) of said web (1), forming an open loop packaging flow;
said method is **characterized in that** it further comprises the steps of:

sterilizing said unwound web (1);
and **in that** it also comprises, after said folding step, the step of moving the sealed containers causing them to follow a U shaped path and leading them onto an outfeed path parallel to the feeding direction (MD) of the web (1).

Patentansprüche

1. Verpackungsmaschine (100) zum Verpacken von fließfähigen Nahrungsmittelprodukten in Behältern (10), die aus einer kontinuierlichen Bahn (1) aus Verpackungsmaterial geformt sind, wobei die Maschine (100) umfasst:

- mindestens eine Abwickeleinheit (110) zum Abwickeln der Bahn (1) von einer Rolle (1') entlang einer Zuführrichtung (MD) der Bahn (1) in der Maschine (100), die im Wesentlichen horizontal zum Boden ist;
- eine Längsversiegelungseinheit (130) zum Versiegeln der Bahn (1) in Längsrichtung, um ein kontinuierliches Rohr (11) aus Verpackungsmaterial zu formen;
- eine Fülleinheit, die angepasst ist, um das fließfähige Nahrungsmittelprodukt in das kontinuierliche Rohr (11) zuzuführen;
- eine Formungseinheit (140), die angepasst ist, um das gefüllte Rohr (11) entlang von Abschnitten quer zur Längsachse (A) des Rohres (11) zu versiegeln und um gefüllte und versiegelte Umhüllungen (10') nacheinander entlang einer Gleitrichtung (SD) des gefüllten Rohres (11) zu trennen;
- eine Falteinheit (150), die stromabwärts der Formungseinheit (140) angeordnet ist und die angepasst ist, um die Formung der gefüllten und versiegelten Umhüllungen (10') in die versiegelten Behälter (10) entsprechend der gewünschten Form abzuschliessen;

wobei die Falteinheit (150) zwischen der Formungseinheit (140) und der Abwickeleinheit (110) innerhalb der Abmessung der Maschine zwischen der Formungseinheit (140) und der Abwickeleinheit (110) angeordnet ist;
wobei die Maschine (100) ferner Fördermittel (152)

umfasst, die stromabwärts der Falteinheit (150) angeordnet sind und die angepasst sind, um versiegelte Behälter (10) aus der Maschine (100) herauszubewegen; **dadurch gekennzeichnet, dass** sie außerdem eine Sterilisationseinheit (120) zum Sterilisieren der abgewickelten Bahn (1) umfasst;
und dass die Fördermittel (152) die versiegelten und geformten Behälter (10) senkrecht zur Zuführrichtung (MD) der Bahn (1) abziehen, indem es bewirkt wird, dass sie einem U-förmigen Weg innerhalb der durch die Abmessung der Maschine definierte Fläche folgen und wodurch sie auf einen Auslaufweg parallel zur Zuführrichtung (MD) der Bahn (1) geführt werden.

2. Verpackungsmaschine (100) nach Anspruch 1, wobei die Abwickeleinheit (110), die Sterilisationseinheit (120) und die Längsversiegelungseinheit (130) entlang der Zuführrichtung (MD) der Bahn (1) nacheinander angeordnet sind, wobei die Fülleinheit und die Formungseinheit (140) entlang der Gleitrichtung (SD) nacheinander angeordnet sind, und wobei die Falteinheit (150) in einer Richtung entgegengesetzt zu der Zuführrichtung (MD) der Bahn (1) angeordnet ist, die eine Verpackungsströmung mit offener Schleife formt.

3. Verpackungsmaschine (100) nach Anspruch 1 oder 2, wobei die Falteinheit (150) die gefüllten und versiegelten Umhüllungen (10') in einer Richtung entgegengesetzt zu der Zuführrichtung (MD) der Bahn (1) bewegt.

4. Verpackungsmaschine (100) nach einem oder mehreren der Ansprüche 1 bis 3, wobei die Falteinheit (150) unterhalb und an der Sterilisationseinheit (120) angeordnet ist.

5. Verpackungsmaschine (100) nach einem oder mehreren der Ansprüche 1 bis 4, wobei die Falteinheit (150) die gefüllten und versiegelten Umhüllungen (10') in eine Strömung, die der Zuführrichtung (MD) überlagert, und dazu parallel, der Bahn (1) an der Sterilisationseinheit (120) angeordnet ist.

6. Verpackungsmaschine (100) nach einem oder mehreren der Ansprüche 1 bis 5, wobei die Maschine (100) Zuführmittel (151) zum Zuführen der gefüllten und versiegelten Umhüllungen (10') umfasst, wobei die Zuführmittel (151) zwischen der Formungseinheit (140) und der Falteinheit (150) angeordnet und mit ihnen operativ verbunden sind.

7. Verpackungsmaschine (100) nach Anspruch 6, wobei die Zuführmittel (151) die gefüllten und versiegelten Umhüllungen (10') in einer Richtung entgegengesetzt zu der Zuführrichtung (MD) der Bahn (1) bewegen.

8. Verfahren zum Verpacken von fließfähigen Nahrungsmittelprodukten in Behältern (10), die aus einer kontinuierlichen Bahn (1) aus Verpackungsmaterial geformt sind, wobei das Verfahren die Schritte umfasst:

- Abwickeln der Bahn (1) von einer Rolle (1') entlang einer Zuführrichtung (MD) der Bahn (1) in einer Verpackungsmaschine (100) nach einem der Ansprüche 1 bis 7,
- Formen eines kontinuierlichen Rohres (11) aus Verpackungsmaterial durch Längsversiegeln der Bahn (1);
- Zuführen des fließfähigen Nahrungsmittelprodukts in das kontinuierliche Rohr (11), das geformt wird;
- Formen von gefüllten und versiegelten Umhüllungen (10') nacheinander aus dem Rohr (11) entlang einer Gleitrichtung (SD) des gefüllten Rohres (11) durch Versiegeln und Schneiden des gefüllten Rohres (11) entlang von Abschnitten quer zur Längsachse des Rohres (11) ;
- Falten der gefüllten und versiegelten Umhüllungen (10') gemäß einer gewünschten Form nach dem Formungsschritt, wodurch die Form der gefüllten Behälter (10) definiert wird;

wobei der Faltschritt durchgeführt wird, während die gefüllten und versiegelten Umhüllungen (10') in einer Richtung entgegengesetzt zu der Zuführrichtung (MD) der Bahn (1) vorrücken, wodurch eine Verpackungsströmung mit offener Schleife geformt wird;
wobei das Verfahren **dadurch gekennzeichnet ist, dass** es ferner die Schritte umfasst: Sterilisieren der abgewickelten Bahn (1);
und dass es nach dem Faltschritt auch den Schritt des Bewegens der versiegelten Behälter umfasst, indem es bewirkt wird, dass sie einem U-förmigen Weg folgen und wodurch sie auf einen Auslaufweg parallel zur Zuführrichtung (MD) der Bahn (1) geführt werden.

Revendications

1. Machine d'emballage (100) de produits alimentaires versables dans des récipients (10) formés à partir d'une bande continue (1) de matériau d'emballage, ladite machine (100) comprenant :

- au moins une unité de déroulement (110) pour dérouler ladite bande (1) d'un rouleau (1') le long d'une direction d'alimentation (MD) de ladite bande (1) dans ladite machine (100) étant substantiellement horizontale par rapport au sol ;
- une unité de fermeture hermétique longitudinale (130) pour fermer hermétiquement ladite bande (1) longitudinalement pour former un tube

continu (11) de matériau d'emballage ;
- une unité de remplissage pouvant alimenter ledit produit alimentaire versable dans ledit tube continu (11) formé ;
- une unité de formation (140) pouvant fermer hermétiquement ledit tube rempli (11) le long de parties transversales à l'axe longitudinal (A) dudit tube (11) et séparer des emballages remplis et fermés hermétiquement (10'), les uns à la suite des autres, le long d'une direction de coulissement (SD) dudit tube rempli (11) ;
- une unité de pliage (150) placée en aval de ladite unité de formation (140) et adaptée pour achever la formation desdits emballages remplis et fermés hermétiquement (10') dans lesdits récipients fermés hermétiquement (10) selon la forme désirée ;

ladite unité de pliage (150) étant disposée entre ladite unité de formation (140) et ladite unité de déroulement (110) à l'intérieur des dimensions de ladite machine entre ladite unité de formation (140) et ladite unité de déroulement (110) ;
ladite machine (100) comprend de plus des moyens de convoyage (152) situés en aval de ladite unité de pliage (150) et pouvant sortir lesdits récipients fermés hermétiquement (10) de ladite machine (100) ;
caractérisée en ce qu'elle comprend aussi une unité de stérilisation (120) servant à stériliser ladite bande déroulée (1) ;
et **en ce que** lesdits moyens de convoyage (152) extraient les récipients fermés hermétiquement et formés (10) perpendiculairement à la direction d'alimentation (MD) de la bande (1) pour leur faire suivre un parcours en « U » à l'intérieur de la zone définie par les dimensions de la machine et pour les amener sur un parcours d'évacuation parallèle à la direction d'alimentation (MD) de la bande (1).

2. Machine d'emballage (100) selon la revendication 1, dans laquelle lesdites unité de déroulement (110), unité de stérilisation (120) et unité de fermeture hermétique longitudinale (130) sont positionnées consécutivement le long de ladite direction d'alimentation (MD) de ladite bande (1), dans laquelle lesdites unité de remplissage et de formation (140) sont disposées consécutivement le long de ladite direction de coulissement (SD), et dans laquelle ladite unité de pliage (150) est disposée dans une direction opposée à la direction d'alimentation (MD) de ladite bande (1), formant un flux d'emballage à circuit ouvert.

3. Machine d'emballage (100) selon la revendication 1 ou 2, dans laquelle ladite unité de pliage (150) déplace lesdits emballages remplis et fermés hermétiquement (10') dans une direction opposée à ladite direction d'alimentation (MD) de ladite bande (1).

4. Machine d'emballage (100) selon l'une ou plusieurs des revendications de 1 à 3, dans laquelle ladite unité de pliage (150) est positionnée en dessous et en correspondance de ladite unité de stérilisation (120).

5. Machine d'emballage (100) selon l'une ou plusieurs des revendications de 1 à 4, dans laquelle ladite unité de pliage (150) déplace lesdits emballages remplis et fermés hermétiquement (10') dans un flux superposé sur, et parallèle à ladite direction d'alimentation (MD) de ladite bande (1) en correspondance de ladite unité de stérilisation (120).

6. Machine d'emballage (100) selon l'une ou plusieurs des revendications de 1 à 5, dans laquelle ladite machine (100) comprend des moyens d'alimentation (151) servant à alimenter lesdits emballages remplis et fermés hermétiquement (10'), lesdits moyens d'alimentation (151) sont interposés entre lesdites, et reliés auxdites unité de formation (140) et unité de pliage (150).

7. Machine d'emballage (100) selon la revendication 6, dans laquelle lesdits moyens d'alimentation (151) déplacent lesdits emballages remplis et fermés hermétiquement (10') dans une direction opposée à ladite direction d'alimentation (MD) de ladite bande (1).

8. Procédé d'emballage de produits alimentaires versables dans des récipients (10) formés à partir d'une bande continue (1) de matériau d'emballage, ledit procédé comprenant les étapes de :

- dérouler ladite bande (1) à partir d'un rouleau (1') le long d'une direction d'alimentation (MD) de ladite bande (1) dans une machine d'emballage (100) selon l'une des revendications de 1 à 7 ;
- former un tube continu (11) de matériau d'emballage en fermant hermétiquement longitudinalement ladite bande (1) ;
- alimenter ledit produit alimentaire versable dans ledit tube continu (11) formé ;
- former des emballages remplis et fermés hermétiquement (10') les uns à la suite des autres à partir dudit tube (11) le long d'une direction de coulissement (SD) dudit tube rempli (11) en fermant hermétiquement et en coupant ledit tube rempli (11) le long de parties transversales à l'axe longitudinal dudit tube (11) ;
- plier lesdits emballages remplis et fermés hermétiquement (10') selon une forme désirée après ladite étape de formation, définissant ainsi la forme desdits récipients remplis (10) ;

ladite étape de pliage étant réalisée pendant que lesdits emballages remplis et fermés hermétiquement (10') progressent dans une direction opposée

à la direction d'alimentation (MD) de ladite bande (1), formant un flux d'emballage à circuit ouvert ;
ledit procédé est **caractérisé en ce qu'**il comprend également les étapes de : stériliser ladite bande déroulée (1) ;
et **en ce qu'**il comprend aussi, après ladite étape de pliage, l'étape consistant à déplacer lesdits récipients fermés hermétiquement pour leur faire suivre un parcours en « U » et pour les amener sur un parcours d'évacuation parallèle à la direction d'alimentation (MD) de la bande (1).

FIG. 1

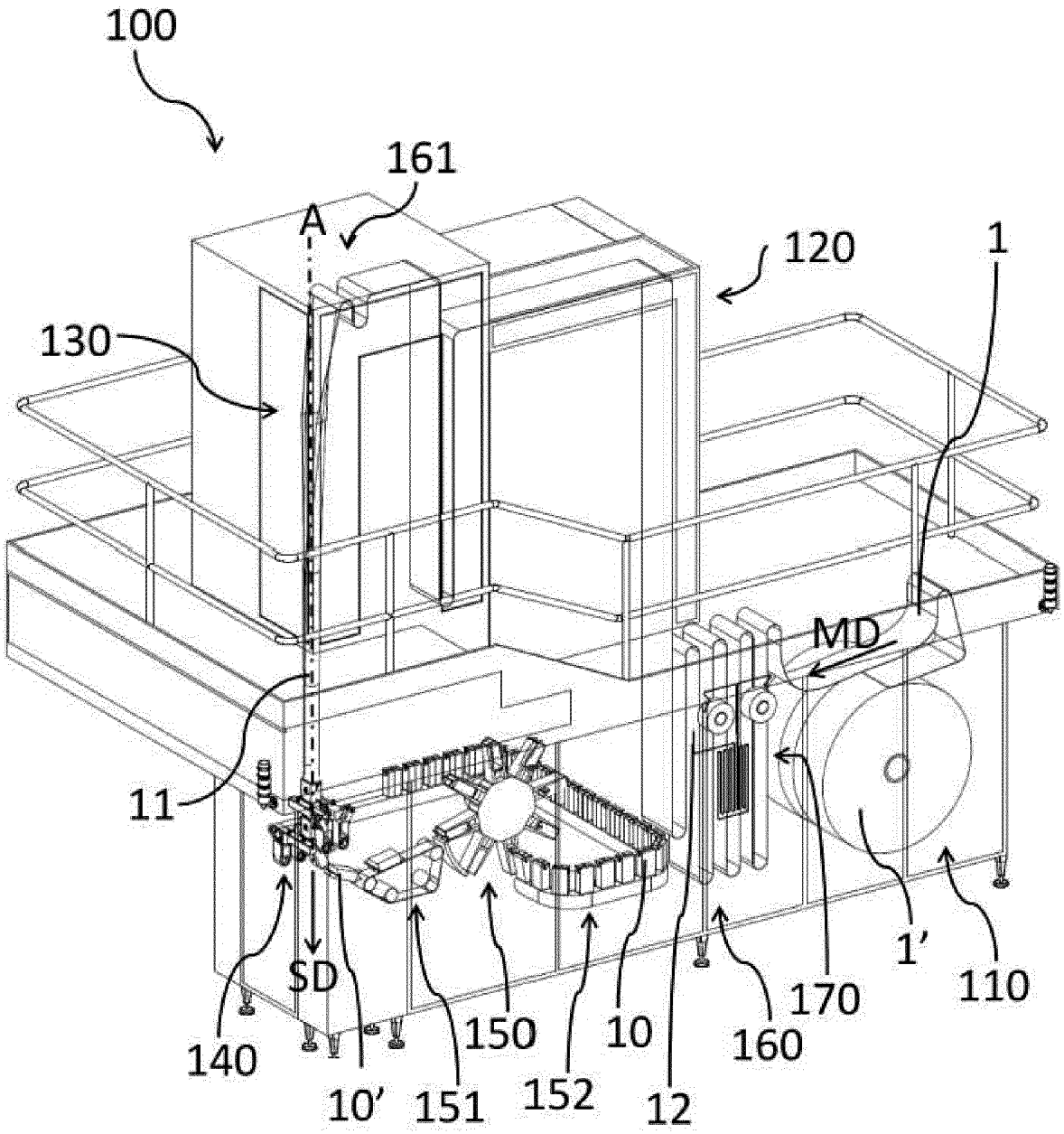


FIG. 2

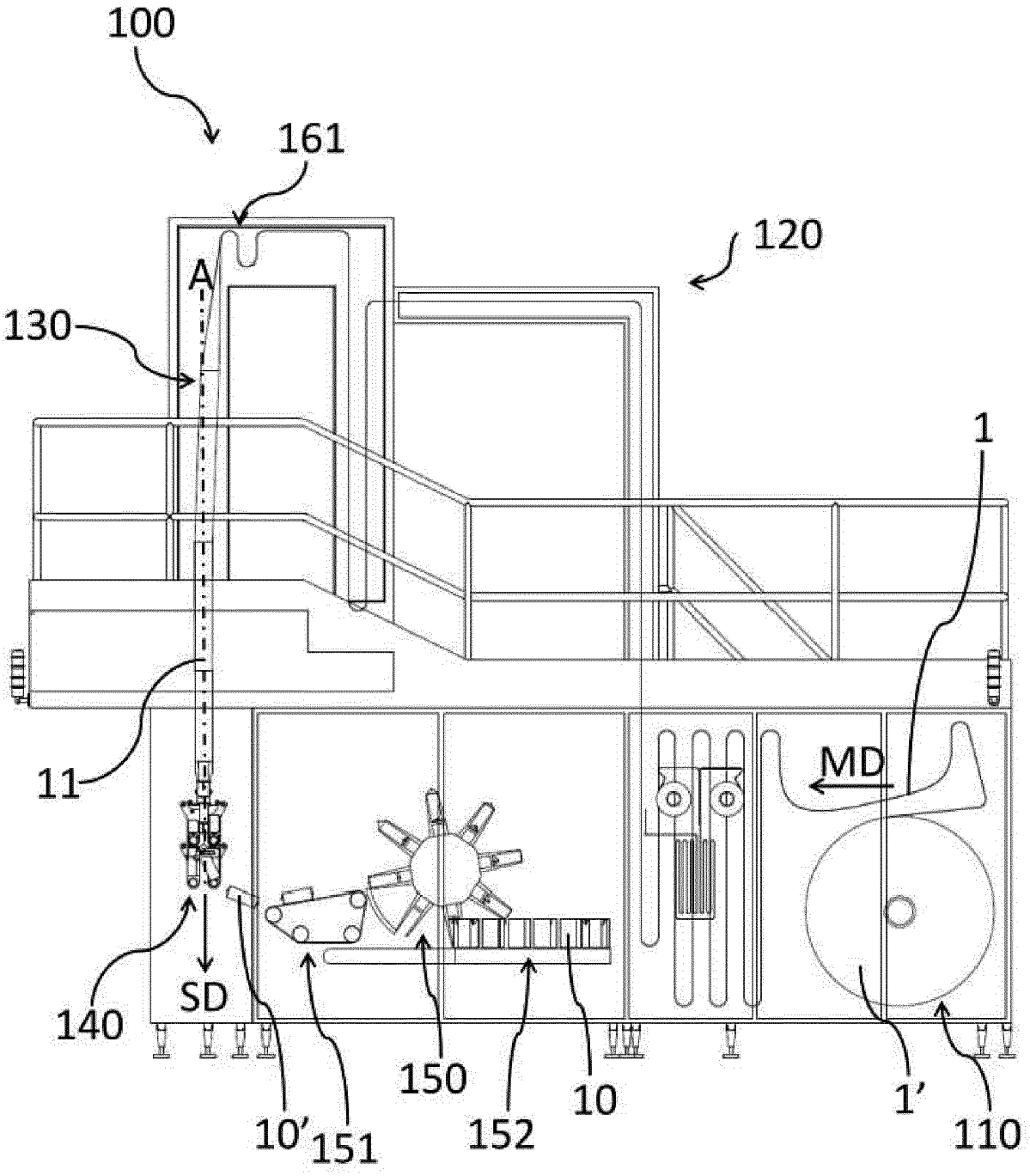
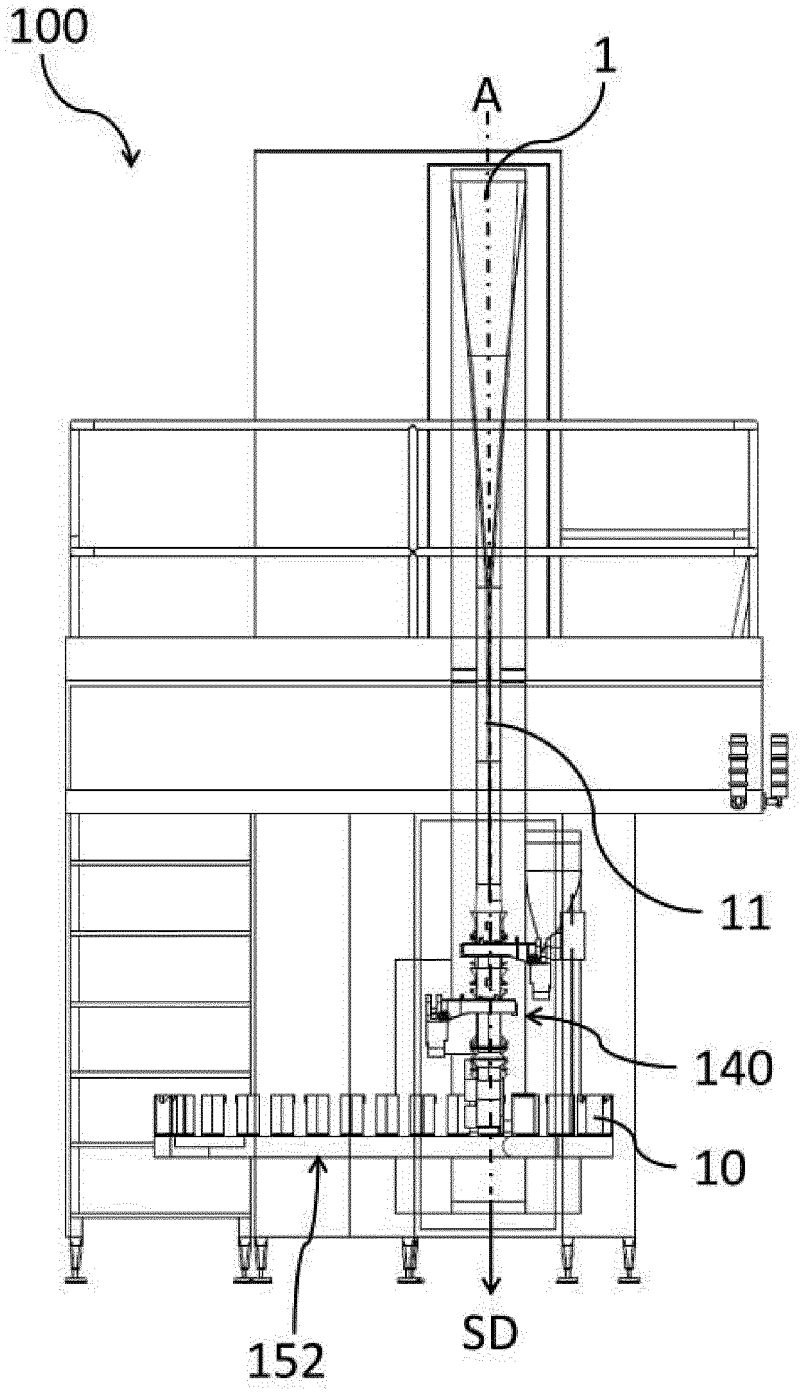


FIG. 3



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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