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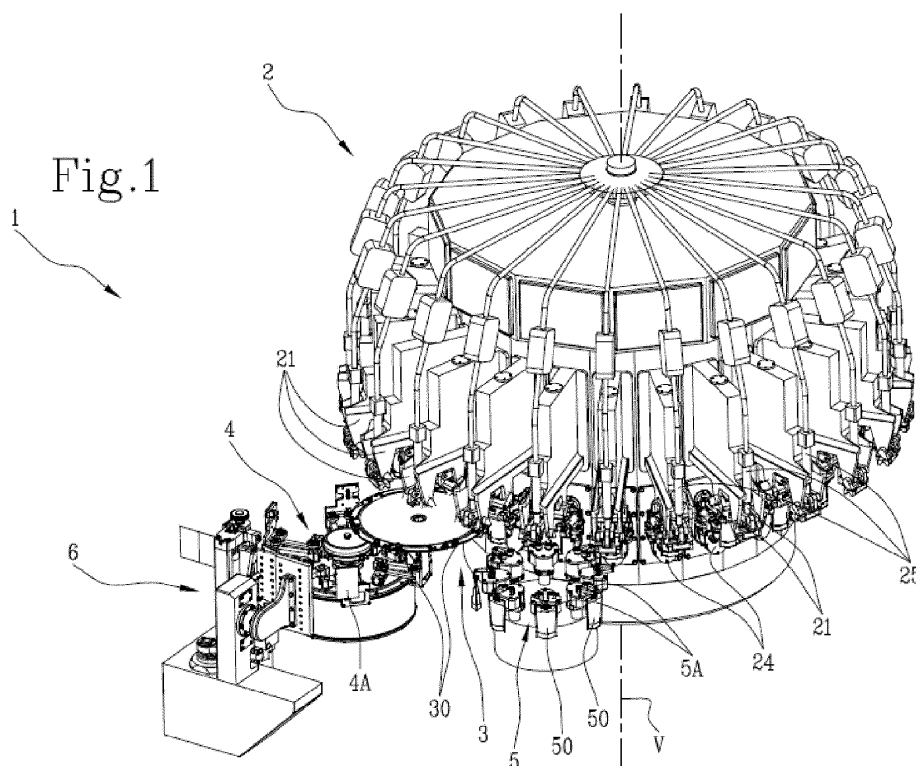
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(54) **PACKAGING MACHINE FOR MAKING A PACKAGE WHICH INCLUDES A BAG OF FLEXIBLE MATERIAL FILLED WITH A DOSE OF LIQUID OR SEMI-LIQUID PRODUCT**

(57) Described is a packaging machine (1) for making a package (50) which includes a bag (40) of flexible material filled with a dose of loose product and coupled with a respective spout (30), comprising: a sealing device (221) movable along a packing path (P) and configured

to seal the bag (30) along its open top end, around the spout (30), a dispensing device (25), movable along the packaging path (P) and configured for introducing the dose of product inside the sealed bag (40), through the spout (30).



Description

Technical Field

[0001] This invention relates to a packaging machine and a method for making a package which includes a bag made of flexible material filled with a dose of loose product and coupled with a respective spout. The term "loose product" means a product with a low cohesion, that is, low adherence between its constituent parts, and therefore without its own shape: it may be a liquid, semi-liquid, grated or powdered product.

Prior Art

[0002] In the field of packages for loose food products, there are prior art packages consisting of a bag made of flexible material (preferably heat-sealable) coupled to a spout made of rigid or semi-rigid material, which is used by a consumer for extracting the product from the bag, for consumption.

[0003] An automatic packaging machine for making a package which includes a bag made of flexible material filled with a dose of loose product is known from patent document EP3257764A1, in the name of the same Applicant. The machine comprises, on a rotary carousel, at least one filling device designed to feed the dose of product inside the bag through its open top end, and at least one sealing device designed to seal the full bag by means of a sealing at the open top end, after feeding the dose of product. There is also an embodiment wherein the sealing device is associated with a device for feeding a cap. This solution has several drawbacks: firstly, filling and then sealing the top end of the bag, the filling may be carried out only up to a level considerably beneath the maximum capacity of the bag, so that the liquid does not interfere with the subsequent sealing and the levels of hygiene are maintained high. Moreover, the filling must be carefully controlled to prevent the product from soiling the flaps of the top end of the bag which will subsequently be sealed, to prevent sealing defects. Moreover, the bag must necessarily be oriented during filling with the open side on its vertical top, to prevent escape of the product during the filling or the subsequent sealing; this orientation places limits on the maximum quantity of product which can be introduced into the bag.

[0004] Patent document US4283901A provides a rotary machine for filling a bag with a cap associated with a spout, formed in advance, removing the cap from the spout and filling the bag through the spout; this machine must be supplied with bags already formed, with respective spouts already fixed; consequently, it must be integrated in a production line which provides another machine dedicated to the formation of the bags, with a consequent increase in the overall dimensions and complication of the production line. Moreover, if the bag already formed remains empty for a long time before being fed to the filling machine, the walls can adhere to each other

causing escape of product from the spout, during filling.

Description of the Invention

[0005] The aim of this invention is to provide a packaging machine and a method for making a package which include a bag made of flexible material filled with a dose of loose product, which overcome at least one of the above-mentioned drawbacks of the prior art.

[0006] These aims are fully achieved by the packaging machine and the method for making a package according to the invention, as characterized in the appended claims.

[0007] The packaging machine according to the invention is configured for making a package including a bag and a spout. The bag is made of flexible material, preferably heat-sealable. The bag is preferably formed starting from a multilayer sheet, comprising a layer of metallic material (for example, aluminium) and a layer of plastic material. The spout is preferably formed from rigid plastic material; the spout is shaped to be associated with a cap (preferably by screwing).

[0008] The machine is configured for receiving the empty bag, with a top end open. The bag in one embodiment is formed by a sheet of multilayer material folded back on itself (in such a way that an edge of the bag is defined by the folding line) and sealed on two of the remaining edges, leaving a remaining edge open; in this case, the open edge defines the open top end. In another embodiment, the bag is formed by a sheet of multilayer material folded back on itself and sealed on the remaining edges, leaving a corner (and part of the edges adjacent to it) open; in this case, the angle defines the open top end. In another embodiment, the bag which is fed is completely open (that is to say, it is composed of a sheet folded back on itself); in this case, the open top end is one of the open sides.

[0009] The machine is configured to receive, for each bag, a respective spout.

[0010] The machine is configured for moving the bag and the spout along a packaging path.

[0011] The machine comprises (at least) one sealing device. The sealing device is movable along the packaging path. The sealing device is configured for sealing the bag along its open top end, around the spout. Thus, the flaps of the top end are joined stably to the spout, at the spout, and between each other, in the zone in which there is no spout. In one embodiment, top end of the bag has a central portion and two lateral portions (between which is the central portion); the two flaps of the top end, in the central portion, are sealed to the spout, whilst the lateral portions are sealed to each other. In this way, the bag is joined stably to the spout: in fact, the spout is sealed between one flap and the other of the top end. Moreover, the bag is closed: the only passage which remains between the inside of the bag and the outside is defined by the opening of the spout.

[0012] The machine comprises a dispensing device. The dispensing device is movable along the packaging

path. The dispensing device is configured for introducing the dose of product inside the sealed bag (that is to say, in its inner space) through the spout. The product therefore passes, due to the dispensing device, through the opening of the spout and enters the inside of the bag. In this way, the bag may be filled up to its maximum capacity. Moreover, the seal (or sealing) does not interfere with the product (which is subsequently introduced, with the bag already sealed), and a clean surface can be sealed, with better results both in terms of quality of the sealing and the levels of hygiene of the package.

[0013] In one embodiment, the dispensing device comprises a straw. The straw has an end (bottom) configured for being inserted in the opening of the spout for dispensing the dose of product inside the bag. The product passes along the inner channel of the straw and comes out of the straw inside the bag (or in the spout), without be dispersed outside and/or generating splashes.

[0014] In one embodiment, the straw (or its inner channel) has a cross section of passage of the product which is less than the opening of the spout. In this way, as the product is inserted into the bag, the air or the gas initially present in the bag escapes through the spout (outside the straw).

[0015] In another embodiment, the additional straw comprises an additional channel for venting the air or gas initially present in the bag. The additional channel may be to the side of the channel or concentric, inside or outside it. The additional channel is sized to penetrate into the bag only in an upper zone, which will not be filled with the liquid.

[0016] In a preferred embodiment, the machine comprises a packaging carousel (hereinafter also referred to as 'carousel'). The packaging carousel includes a plurality of seats (hereinafter as also referred to as 'seats') which are angularly spaced. Each seat is configured to receive (and retain) a bag and a respective spout. Each seat (or processing unit) comprises a respective sealing device and a respective filling device. The sealing device and the filling device are on-board the packaging carousel, repeated in each seat (or processing unit) of the packaging carousel. The sealing device and the filling device of each seat (or processing unit) rotate on the carousel together with the respective seat (or processing unit). The packaging path extends along a circular periphery of the packaging carousel (from a corner for loading the bags and the spouts to a corner for discharging the finished packages).

[0017] In one embodiment, the machine comprises a control unit programmed for activating in succession, for each packaging seat, firstly the sealing device and then the dispensing device, during a rotation of the packaging carousel (and, therefore, a forward movement of the bag and the spout along the packaging path). In one embodiment, the control unit controls, before the activation of the sealing device, a gripping of the spout and its insertion in the open end of the bag, by means of a pickup element of the spout.

[0018] In one embodiment, the control unit is programmed for activating the sealing device of each packaging seat when the respective packaging seat is in (or enters) in a first circular sector of the carousel (the first circular sector is the same for all the seats). In one embodiment, the control unit is programmed for activating the filling device of each packaging seat when the respective packaging seat is in (or enters) in a second circular sector of the carousel (the first circular sector is the same for all the seats). The second circular sector is downstream of the first circular sector in the direction of rotation of the packaging carousel. In each seat there is, therefore, firstly an activation of the sealing device and then (when sealing is completed) an activation of the filling device.

[0019] In one embodiment, each packaging seat includes an arm for supporting the bag. The supporting arm of the bag is configured to support the bag (during the sealing and during the filling). The arm for supporting the bag is also configured for moving the bag along a radial direction, formed along a radius of the packaging carousel, from a first radial position to a second radial position. The sealing device of each seat is configured for sealing the bag positioned in the first radial position. The dispensing device of each seat is configured for filling the bag positioned in the second radial position. The second radial position is different from the first. In this way, the sealing device and the filling device do not mechanically interfere with each other.

[0020] In one embodiment, each packaging seat includes a spout gripping element. The pickup element of the spout is movable along the packaging path (together with the respective seat) and is configured for receiving and retaining the spout. Moreover, the pickup element of the spout is preferably configured for moving the spout along a vertical direction (parallel to the weight force) for inserting it, at least partly inside the open top end of the bag. This movement includes a lowering. This movement is prior to the sealing. The gripping element of the spout is, preferably, configured to insert the spout (at least partly) in the open end of the bag when the bag is in the first radial position. The pickup element of the spout is preferably associated with the sealing device: in effect, the control unit firstly commands the pickup unit to position the spout inside the top end of the bag and then, whilst the pickup element retains the spout in its position, commands the sealing device to seal the top end of the bag around the spout.

[0021] In one embodiment, the sealing device includes a first gripper (or first grippers) configured for closing the top end of the bag around the spout. The first gripper in one embodiment surrounds the spout pickup element.

[0022] In one embodiment the sealing device includes one or more electrical resistors (preferably integrated in the first gripper) configured for heat sealing the top end of the bag (whilst it is kept closed, that is, the flaps are kept close, by the action of the first gripper).

[0023] In another embodiment, the sealing device in-

cludes one or more ultrasound emitters (preferably integrated in the first gripper), configured for sealing by means of ultrasound the top end of the bag (whilst it is kept closed, that is, the flaps are kept close, by the action of the first gripper).

[0024] This invention also provides a method for making a package which includes a bag made of flexible material filled with a dose of loose product coupled to a respective spout.

[0025] The method comprises a step for receiving the empty bag, with an open top end, and the respective spout at a packaging machine.

[0026] The method comprises a step of picking up the bag. The method comprises a step of gripping the respective spout.

[0027] The method comprises a step of moving the bag and the respective spout inside the packaging machine along a packaging path. The movement is preferably continuous.

[0028] The method comprises a step of inserting the spout in the open top end of the bag.

[0029] The method comprises a step of sealing the bag along its open top end, around the spout, by means of a sealing device of the machine. The sealing is performed simultaneously with the movement of the bag and the spout along the packaging path.

[0030] The method comprises a step for inserting the dose of product inside the bag, by means of a dispensing device of the machine. The introduction (also referred to as filling) occurs during the movement of the bag and the spout along the packaging path.

[0031] The step for introducing the dose of product into the bag follows the step for sealing the bag.

[0032] Preferably, the step for introducing the dose of product into the bag comprises a passage of the dose of product through the spout.

[0033] Preferably, the step of introducing the dose of product inside the bag comprises an insertion of a straw of the dispensing device in the bag, through the spout, so as to guide the product, through the straw and through the spout, inside the bag.

[0034] Preferably, the movement step comprises a rotation of a packaging carousel. Preferably, the packaging path extends along the circular periphery of the packaging carousel. The packaging carousel includes a plurality of angularly spaced packaging seats.

[0035] In one embodiment, the packaging carousel rotates continuously (about its own central axis of symmetry) during the steps of receiving the bag, sealing the bag and introducing the dose of product inside the bag.

[0036] Each packaging seat receives a respective bag and a respective spout. The receiving is performed in one seat at a time, when it passes a certain angular position of the packaging carousel. Each packaging seat includes a respective sealing device and a respective filling device. For each packaging seat, the sealing device is activated firstly and, subsequently, the dispensing device, during the rotation of the carousel. The sealing de-

vice and the dispensing device are activated (by the control unit) in one seat at a time, when it passes corresponding angular positions (predetermined) on the carousel.

[0037] In one embodiment, the step of sealing the bag is performed when the bag is in a first radial position. In one embodiment, the step of inserting the dose of product inside the bag is performed when the bag is in a second radial position. The second radial position is different from the first.

[0038] In one embodiment, the method comprises a step of transferring the bag and the spout from the first radial position to the second radial position, after the sealing step and before the step of introducing the dose of product inside the bag.

[0039] In one embodiment, the sealing includes a heat sealing along a sealing zone. The sealing zone is defined by the top end of the bag. In this case, preferably, during the transfer of the bag and the spout from the first radial position to the second radial position, there is a cooling of the sealing zone, before the step of inserting the dose of product inside the bag (or filling). This makes it possible to avoid inserting the product in a bag with the edges overheated, which would cause an overheating of the product. Moreover, the cooling prior to the filling prevents the wrinkling of the bag in the heat-sealed zone.

[0040] In one embodiment, the bag has a rectangular shape and is sealed around the spout in such a way that the spout is sealed along one side of the rectangular shape. In this embodiment, during the step of introducing the dose of product inside the bag, the bag is oriented in such a way that the long side on which is sealed the spout is at a vertical top of the bag. The bag is elongate along a respective axis (parallel to a pair of sides of the bag, preferably the long sides); in this case, the axis of the bag during the step of introducing the dose in the bag is parallel to the vertical direction.

[0041] In another embodiment, the bag has a rectangular shape and is sealed around the spout in such a way that the spout is sealed at a corner of the rectangular shape. In this embodiment, during the step of introducing the dose of product inside the bag, the bag is inclined in such a way that the corner on which is sealed the spout is at a vertical top of the bag. In this case, the axis of the bag (parallel to a pair of sides of the bag, preferably the long sides) during the step of introducing the dose into the bag is oriented by an angle of between 20° and 80° to the vertical direction (preferably 45°; in one embodiment, 30°; in another embodiment, 60°).

[0042] In this way, whether the spout is sealed along a side of the bag or the spout is sealed at a corner of the bag, during the filling the spout is located at the apex of the bag, allowing a maximum filling of the internal space of the bag.

[0043] The features of the invention will become more apparent from the following description of a preferred, non-limiting embodiment of it, illustrated by way of example in the accompanying drawings.

Brief Description of the Drawings

[0044]

Figure 1 illustrates a perspective view of a packaging machine for making a package comprising a bag associated with a respective spout, according to this invention;

Figure 2 illustrates a top view of the packaging machine of Figure 1;

Figure 3 illustrates a detail of the packaging machine of Figure 1 in a step of gripping the spout;

Figure 4 illustrates the detail of Figure 3 in a step of inserting the spout in an open top end of the bag;

Figure 5 illustrates the detail of Figure 3 in a step of sealing the bag;

Figure 6 illustrates the detail of Figure 3 in a step of cooling the bag;

Figure 7 illustrates the detail of Figure 3 in a step of introducing the dose of product inside the bag;

Figures 8A and 8B illustrate a package according to this invention, including a bag and a spout, in two corresponding embodiments.

Preferred Forms of Embodiment of the Invention

[0045] With reference to the accompanying drawings, the numeral 1 denotes a packaging machine according to this invention. The packaging machine 1 is configured for making a package 50. The package 50 includes a bag 40 filled with a dose of product and a spout 30, coupled to the bag 40. The spout 30 is configured to be coupled (preferably, screwed) to a cap, for closing the package 50.

[0046] The machine 1 comprises a bag introducing device 6. The device 6 for introducing bags is configured to receive the empty bags 40. The empty bags 40 have one end (the top end) open. The empty bags 40 preferably have a rectangular shape and are closed on three sides, whilst one side is open and constitutes the open top end. The device 6 preferably receives the bags 40 stacked (that is to say, arranged in stacks, that is, packs). Alternatively, the device 6 may receive the bags 40 from a conveyor belt.

[0047] The machine 6 comprises a wheel 4 for feeding bags 40. The wheel 4 receives the bags 40 from the device 6 for introducing the bags 40. Preferably, the device 6 delivers to the wheel 4 the bags 40 oriented parallel to a vertical direction V. The wheel 4 comprises a plurality of seats 4A of the feed wheel 4, in each of which is received and retained a bag 40 (for example, sucking air and creating a vacuum). The wheel 4 rotates about its own axis of rotation (preferably vertical). In one embodiment, the wheel 4 rotates in an anti-clockwise direction (seen from above).

[0048] The machine 1 comprises a packaging carousel 2. The packaging carousel 2 rotates about its own axis of rotation (preferably vertical). In one embodiment, the

packaging carousel 2 rotates in a clockwise direction (seen from above).

[0049] The wheel 4 is configured for feeding the bags 40, received from the device 6 for introducing the bags 40, to the packaging carousel 2. More specifically, each bag 40 is fed to a seat of the packaging carousel 2 (the packaging carousel 2 comprises a plurality of angularly spaced seats).

[0050] The machine 1 comprises a wheel 3 for feeding spouts 30. The wheel 3 rotates about its own axis of rotation. The wheel 3, in one embodiment, rotates in an anti-clockwise direction (seen from above). The wheel 3 for feeding the spouts 30 comprises a plurality of seats 3A, each of which is configured to receive, retain and move a spout 30. The wheel 3 is configured for feeding the spouts 30 to the packaging carousel 2. Each spout 30 is fed to a seat of the packaging carousel 2. Thus, each seat of the packaging carousel 2 receives a spout 30 from the wheel 3 for feeding the spouts 30 and a bag 40 from the wheel 4 for feeding the bags 40.

[0051] The packaging carousel 2 is configured for filling the bags 40 with a dose of product and for sealing the top end around the respective spout 30, thereby producing the finished package 50 (to which the cap is screwed, inside the machine 1 or downstream of it).

[0052] The machine 1 comprises a transfer wheel 5. The transfer wheel 5 rotates about its own axis of rotation (preferably vertical). In one embodiment, the transfer wheel 5 rotates in an anti-clockwise direction (seen from above). The transfer wheel 5 comprises a plurality of seats 5A, each of which is configured to receive, retain and move a package 50 from the packaging carousel 2. The transfer wheel 5 is configured for transferring the packages 50 from the transfer carousel 2 to a machine downstream, which may be, for example, a machine configured for screwing the caps to the spouts 30.

[0053] The packaging carousel 2 defines a packaging path P. The packaging path P extends along a circular periphery of the packaging carousel 2 from an angle α for receiving the caps 30 and the bags 40 up to an angle ζ at the end of introducing the product in the bags 40.

[0054] Each seat of the packaging carousel 2 comprises a limb 21.

[0055] The machine 1 comprises a unit 220 for picking up the spout 30 for each seat of the packaging carousel 2. The pickup element 220 of the spout 30 is connected to the limb 21 (supported by the limb 21). The pickup element 220 is configured for receiving the spout 30 (from the wheel 3 for feeding the spout 30), and retaining it. The pickup element 220 is shaped like a gripper, having an open position, for receiving the spout 30, and a closed position, for retaining it and moving it.

[0056] The machine 1 comprises an arm 24 for each seat of the packaging carousel 2. The arm 24 is configured for receiving the bag 40 (from the wheel 4 for feeding the bags 40), and retaining it.

[0057] The pickup element 220 is configured for moving the spout 30, towards the bag 40, for inserting it in

the open top end. This movement of the spout 30 by the pickup element 220 occurs along a vertical direction V, from the top downwards. The inserting of the spout 30 in the top end of the bag 40 occurs when the respective seat of the packaging carousel 2 is at an insertion angle β . The insertion angle β is downstream of the receiving angle α in the direction of rotation of the packaging carousel 2 (along the packaging path P).

[0058] The machine 1 comprises a sealing device 221 for each seat of the packaging carousel 2. The sealing device 221 is connected to the limb 21. The sealing device 221 is mounted at the end of the first grippers 22 (or first gripper 22), connected to the limb 21. The first grippers 22 surround the pickup element 220 of the spout 30. Inside the sealing device 221 are positioned heating elements (for example, electrical resistors). The first grippers 22 have an open position and a closed position. In the open position of the first grippers 22, the sealing device 221 is at rest (the grippers 22 are open during the gripping and insertion of the spout 30). The unit for controlling the machine 1 controls a closure of the first grippers 22, for tightening the sealing device 221 in contact with the open end of the bag 40, when the respective seat is located at a start of sealing angle γ . The first grippers 22 remain closed until the respective seat reaches a predetermined end of sealing angle δ , wherein the control unit controls the opening of the first grippers 22. The angle γ is located downstream of the insertion angle β in the direction of rotation of the packaging carousel 2. The end of sealing angle δ is located downstream of the start of sealing angle γ in the direction of rotation of the packaging carousel 2. A first circular sector of packaging carousel 2 is defined between the start of sealing angle γ and the end of sealing angle δ in which the seal occurs (or sealing) occurs. The control unit is programmed to activate the sealing device 221 of each seat of the packaging carousel 2 when the seat is in (that is, enters) the first circular sector.

[0059] Simultaneously with the opening of the first grippers 22 which support the sealing device 221, the control unit also commands the opening of the pickup element 220 of the spout 30. In effect, when the bag 40 reaches the angle δ , the sealing is completed and the spout 30 is joined stably (by the sealing) to the bag 40, thus the arm 24 which initially supported the bag 40 also supports the respective spout 30.

[0060] The bag 40, during the steps of gripping and inserting the spout 30 and sealing, is in a first radial position. The first grippers 22 are positioned in such a way as to interact with the bag 40 in the first radial position. Therefore, the first grippers 22 are positioned at the first radial position.

[0061] When each seat of the packaging carousel 2 is located at the angle δ , the arm 24, using a first actuator 241 and a second actuator 242 of the seat, to which the arm 24 is connected, moves the bag 40 along a radial direction R, from the first radial position to a second radial position (as soon as the first grippers 22 release the bag

40). The radial direction R is defined along a radius of the packaging wheel 2. The second radial position according to an embodiment is further from the centre of the packaging carousel 2 relative to the first radial position.

[0062] The machine 1 comprises second grippers 23 for each seat of the packaging carousel 2. The second grippers 23 are positioned in such a way as to interact with the bag 40 in the second radial position. In other words, the second grippers 23 are positioned at the second radial position. The second grippers 23 can be operated in a closed position and in an open position.

[0063] The control unit is configured for controlling the closing of the second grippers 23 when the respective seat of the packaging carousel 2 is located at the angle δ , as soon as the bag 40 has been transferred to the second radial position. The second grippers 23 are made of electrically conductive material such as to cool the top end of the bag 40 which has been sealed.

[0064] The machine 1 comprises a dispensing device 25 for each seat of the packaging carousel 2. The dispensing device 25 is integrated in the limb 21. The dispensing device 25 comprises a straw 251. The straw 251 is configured for being passed through by the product. The straw 251 has an end 251A. The straw 251 is elongated (at least partially) along the vertical direction V and the end 251A is the bottom end. The bottom end 251A of the straw 25 has a width less than a diameter of the straw 30 (the diameter of its opening), so as to be able to penetrate inside and leave sufficient space outside the straw 25 for the escape of air during the filling of the bag 40. The bottom end 251A of the straw 25 is configured for being inserted in the opening of the spout 30, for dispensing the dose of product inside the bag 40.

[0065] The dispensing device 25 has an activated position and a deactivated position. In the activated position, the straw 251 is lowered so that the bottom end 251A penetrates into the spout 30.

[0066] The control unit is configured to control an activation of the dispensing device 25, and therefore a movement of the straw along the vertical direction V from the top downwards, when the respective seat of the packaging carousel 2 is located at a start of filling angle ε . The start of filling angle ε is downstream of the end of sealing angle δ in the direction of rotation of the packaging carousel 2. Between the end of sealing angle δ and the start of filling angle ε there is a cooling of the sealed end.

[0067] The control unit is designed to command a deactivation of the dispensing device 25, therefore a raising of the straw 251, when the respective seat is located at an end of filling angle ζ . The end of filling angle ζ is downstream of the start of filling angle ε in the direction of rotation of the packaging carousel 2. Between the start of filling angle ε and the end of filling angle ζ there is a second circular sector of the packaging carousel 2. For each seat of the packaging carousel 2, the filling (inserting the dose of product) occurs when the seat is in the second sector; thus, the control unit is programmed for

activating the dispensing device 25 when the seat is in (or enters) the second sector. The second sector is downstream of the first sector, in the direction of rotation of the packaging carousel 2.

[0068] The control unit is configured to control an opening of the second grippers 23 when the respective seat of the packaging carousel 2 arrives at the transfer wheel 5.

[0069] The bag 4 preferably has a rectangular shape. The bag 4 preferably has a wide base (by a double folding of the sheet from which the bag 40 is formed). The bag 40 is preferably symmetrical about an axis A of the bag 40.

[0070] In one embodiment, the open top end in which the spout 30 is inserted and sealed is the side of the bag 40 opposite the base. This shape of the package 50 is also referred to as the first format. In this embodiment, the bag 40 is received and retained in each seat of the packaging carousel 2 with its axis A parallel to the vertical direction.

[0071] In another embodiment, the open top end in which the spout 30 is inserted and sealed is a corner portion of the bag 40 (not adjacent to the base). This shape of the package 50 is also referred to as the first format. In this embodiment, the bag 40 is received and retained in each seat of the packaging carousel 2 with its axis A oblique relative to the vertical direction.

[0072] The machine according to this invention is configured for controlling both bags 40 in which the spout 30 must be sealed along the side (first format) and bags 40 in which the spout 30 must be sealed in the corner portion (second format). The control unit is configured for receiving a setting relative to the format (for example, first format or second format) and to arrange the seats of the carousel 2 for making packages 50 of the desired format.

[0073] This invention also provides a method for making a package 50 which includes a bag 40 filled with a dose of product coupled with a respective spout 30.

[0074] The method comprises a step for feeding the empty bag 40 to an introducing device 6 of a packaging machine 1.

[0075] The method comprises a step for transferring the empty bag 40 from the introducing device 6 to a wheel 4 for feeding the bags 40. The method comprises a step for feeding the bag 40 to a packaging carousel 2; the feeding occurs by means of the wheel 4 for feeding the bags 40.

[0076] The method comprises a step for feeding a respective spout 30 to a wheel 3 for feeding the spouts 30. The method comprises a step for feeding the spout 30 to the packaging carousel 2, by means of the wheel 3 for feeding the spouts 30.

[0077] The packaging carousel 2 rotates continuously in its direction of rotation. The carousel 2 comprises a plurality of seats.

[0078] The method comprises a step for gripping the spout 30 by a pickup element 220 of a seat of the packaging carousel 2.

[0079] The method comprises a step for gripping the bag 40 by an arm 24 of the seat of the packaging carousel 2. The bag 40 is received by the carousel 2 with the top end open (that is to say, with the flaps of the top end separate and spaced).

[0080] A bag 40 and a respective spout 30 are picked up in each seat when it passes an angle α of the carousel 2 (the receiving angle).

[0081] The method comprises a step of inserting the spout 30 in the respective bag 40. The inserting preferably comprises a vertical movement (lowering) of the pickup element 220 of the spout 30. In one embodiment, the inserting comprises a vertical movement (raising) of the arm 24 which supports the bag 40. In one embodiment, the inserting comprises both a vertical movement (raising) of the arm 24 which supports the bag 40 and a vertical movement (lowering) of the pickup element 220 of the spout 30.

[0082] The spout 30 is inserted into the bag 40 for each seat when it passes an angle β of the carousel 2 (the insertion angle).

[0083] The method comprises a step of sealing the bag 40 along its open top end, around the spout 30. The sealing is performed by means of a sealing device 221, provided in each seat of the carousel 2.

[0084] For each seat, the sealing device 221 is activated when the seat passes an angle γ of the carousel 2 (the start of sealing angle) and is deactivated when it passes an angle δ of the carousel 2 (the end of sealing angle).

[0085] In one embodiment, the sealing is performed by heat sealing. In this embodiment the method comprises a step of cooling the heat-sealed zone, from the end of sealing angle δ (also called the start of cooling angle) of the carousel 2 and a subsequent angle ϵ (the start of filling angle or end of cooling angle).

[0086] The method comprises a step of moving the bag 40 and the spout 30 along a radial direction R from a first radial position (in which the bag 40 has been sealed to the spout 30 along its top end) to a second radial position (in which the bag 40 will be filled). The movement along the radial direction R occurs, for each seat, when the seat passes the end of sealing angle δ (or start of cooling angle).

[0087] The method comprises a step of inserting the dose of product inside the bag 40 (also known as the step of filling the bag 40). The introduction of the dose of product inside the bag 40 occurs through the spout 30, by means of a dispensing device 25 which delivers the product into the bag 40 through the spout 30.

[0088] For each seat, the dispensing device 25 is activated when the seat passes the start of filling angle ϵ and is deactivated when the seat passes the subsequent end of filling angle ζ . Thus, the introduction of the dose of product inside the bag 40 occurs when the seat is in the circular sector between the start of filling angle ϵ and the end of filling angle ζ .

1	Packaging machine
2	Packaging carousel
21	Packaging carousel limbs
R	Radial direction
V	Vertical direction
22	First grippers
221	Sealing device
220	Spout pickup element
23	Second grippers
24	Arms
241	First actuator
242	Second actuator
25	Dispensing device
251	Straws
251A	End of straw
3	Spout feeding wheel
3A	Seats of the spout feeding wheel
30	Spout
4	Bag feeding wheel
4A	Seats of the wheel for feeding bags
40	Bags
5	Transfer wheel
5A	Seats of the transfer wheel
50	Finished package
6	Bags introduction device
α	Angular position for receiving cap
β	Angular position of insertion of cap into bag
γ	Angular sealing position
δ	Angular position of translation
ε	Angular position at start of filling
ζ	Angular position at end of filling
V	Vertical direction
P	Packaging path
A	Axis of the bag

Claims

1. A packaging machine (1) for making a package (50) which includes a bag (40) of flexible material filled with a dose of loose product and coupled with a respective spout (30), the machine (1) being config-

ured to receive the empty bag (40) with an open top end, and the respective spout (30) and to move them along a packaging path (P), and comprising:

- 5 - a sealing device (221) movable along the packaging path (P) and configured to seal the bag (40) along its open top end, around the spout (30);
- 10 - a dispensing device (25) movable along the packaging path (P), **characterized in that** the dispensing device (25) is configured to fill the dose of product into the sealed bag (40) through the spout (30).

- 15 **2.** The machine (1) according to claim 1, wherein the dispensing device (25) comprises a straw (251) having one end (251A) configured to be inserted into an opening of the spout (30) in order to fill the dose of product into the bag (40).

- 20 **3.** The machine (1) according to claim 2, wherein the straw (251) has a product flow cross sectional size which is smaller than the opening of the spout (30).

- 25 **4.** The machine (1) according to any one of the preceding claims, comprising a rotating packaging carousel (2) having a plurality of angularly spaced packaging seats, wherein each packaging seat is configured to receive a respective bag (40) and a respective spout (30) and includes a respective sealing device (221) and a respective filling device (25), wherein the packaging path (P) extends along a circular periphery of the packaging carousel (2).

- 35 **5.** The machine (1) according to claim 4, comprising a control unit programmed to activate the sealing device (221) and the dispensing device (25), one after the other in succession for each packaging seat, during rotation of the packaging carousel (2).

- 40 **6.** The machine (1) according to claim 5, wherein the control unit is programmed to activate the sealing device (221) of each packaging seat when the respective packaging seat is located in a first circular sector of the packaging carousel (2) and to activate the dispensing device (25) of each packaging seat when the respective packaging seat is located in a second circular sector of the packaging carousel (2), wherein the second circular sector is downstream of the first circular sector in the direction of rotation of the packaging carousel (2).

- 55 **7.** The machine (1) according to any one of claims 4 to 6, wherein each packaging seat includes an arm (24) for supporting the bag (40) and configured to move the bag along a radial direction (R), defined along a radius of the packaging carousel (2), from a first radial position to a second radial position, wherein the

sealing device (221) of each packaging seat is configured to seal the bag (40) disposed at the first radial position, and the dispensing device (25) of each packaging seat is configured to fill the bag (40) disposed at the second radial position.

8. The machine (1) according to any one of claims 4 to 7, wherein each packaging seat includes a pickup element (220) for picking up the spout (30) and configured to receive and retain the spout (30) and to move it along a vertical direction (V) parallel to the weight force, in such a way as to insert it at least partly into the open top end of the bag (40).

9. The machine (1) according to any one of the preceding claims, wherein the sealing device (221) includes a first gripper (22), configured to close the top end of the bag (40) around the spout (30), and one or more electrical resistors built into the first gripper (22) and configured to heat-seal the top end of the bag (40) around the spout (30).

10. A method for making a package (50) which includes a bag (40) of flexible material filled with a dose of loose product and coupled with a respective spout (30), the method comprising the following steps:

- receiving the empty bag (40), with an open top end, and the respective spout (30) in a packaging machine (1);
- moving the bag (40) and the respective spout (30) along a packaging path (P) within the packaging machine (1);
- sealing the bag (40) along its open top end, around the spout (30) by means of a sealing device (221) forming part of the machine (1) while the bag (40) and the spout (30) are being moved along the packaging path (P);
- filling the dose of product into the bag (40) by means of a dispensing device (25) forming part of the machine (1) while the bag (40) and the spout (30) are being moved along the packaging path (P);

characterized in that the step of filling the dose of product into the bag (40) follows the step of sealing the bag (40).

11. The method according to claim 10, wherein the step of filling the dose of product into the bag (40) comprises passing the dose of product through the spout (30).
12. The method according to claim 10 or 11, wherein the step of moving comprises continuously rotating a packaging carousel (2), whose circular periphery defines the packaging path (P), wherein the packaging carousel (2) includes a plurality of angularly spaced

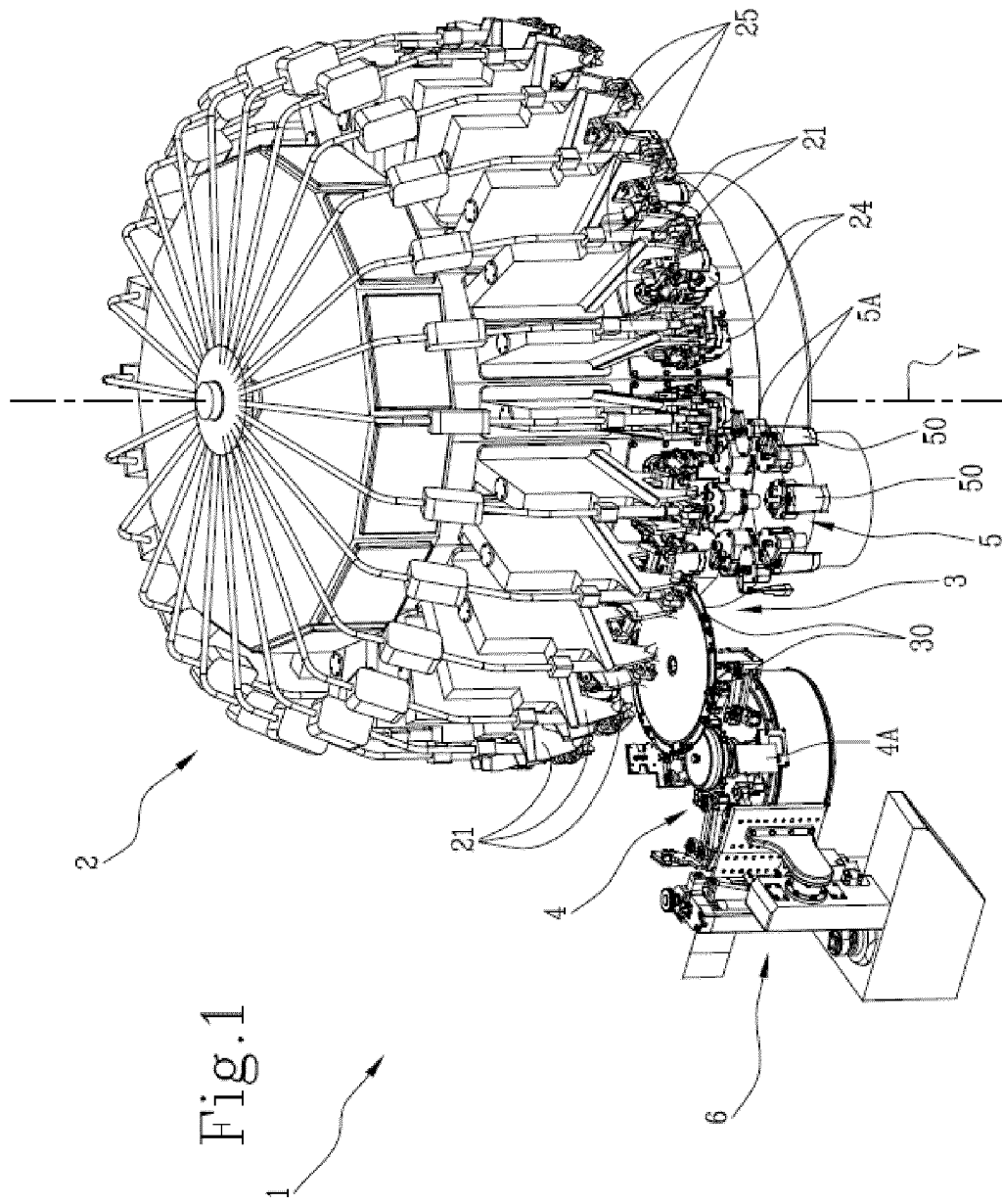
packaging seats, wherein each packaging seat receives a respective bag (40) and a respective spout (30) and includes a respective sealing device (221) and a respective filling device (25), wherein, for each packaging seat, first the sealing device (221) is activated, and then the dispensing device (25), while the packaging carousel (2) rotates.

13. The method according to claim 12, wherein the step of sealing the bag (40) is performed when the bag (40) is at a first radial position, and the step of filling the dose of product into the bag (40) is performed when the bag (40) is at a second radial position, different from the first, and the method comprises a step of transferring the bag (40) and the spout (30) from the first radial position to the second radial position, after the step of sealing and before the step of filling the dose of product into the bag (40).

14. The method according to claim 13, wherein the step of sealing includes heat-sealing a sealing zone of the bag (40) and wherein the sealing zone is cooled while the bag (40) and the spout (30) are transferred from the first radial position to the second radial position.

15. The method according to any one of claims 10 to 14, wherein the bag (40) is rectangular in shape and is sealed around the spout (30) in such a way that the spout (30) is sealed along one side of the rectangular shape and wherein, during the step of filling the dose of product into the bag (40), the bag (40) is oriented with its axis of symmetry (A) parallel to a vertical direction (V), parallel to the weight force.

16. The method according to any one of claims 10 to 14, wherein the bag (40) is rectangular in shape and is sealed around the spout (30) in such a way that the spout (30) is sealed at an angle to the rectangular shape and wherein, during the step of filling the dose of product into the bag (40), the bag (40) is oriented with its axis of symmetry (A) inclined to a vertical direction (V), parallel to the weight force.



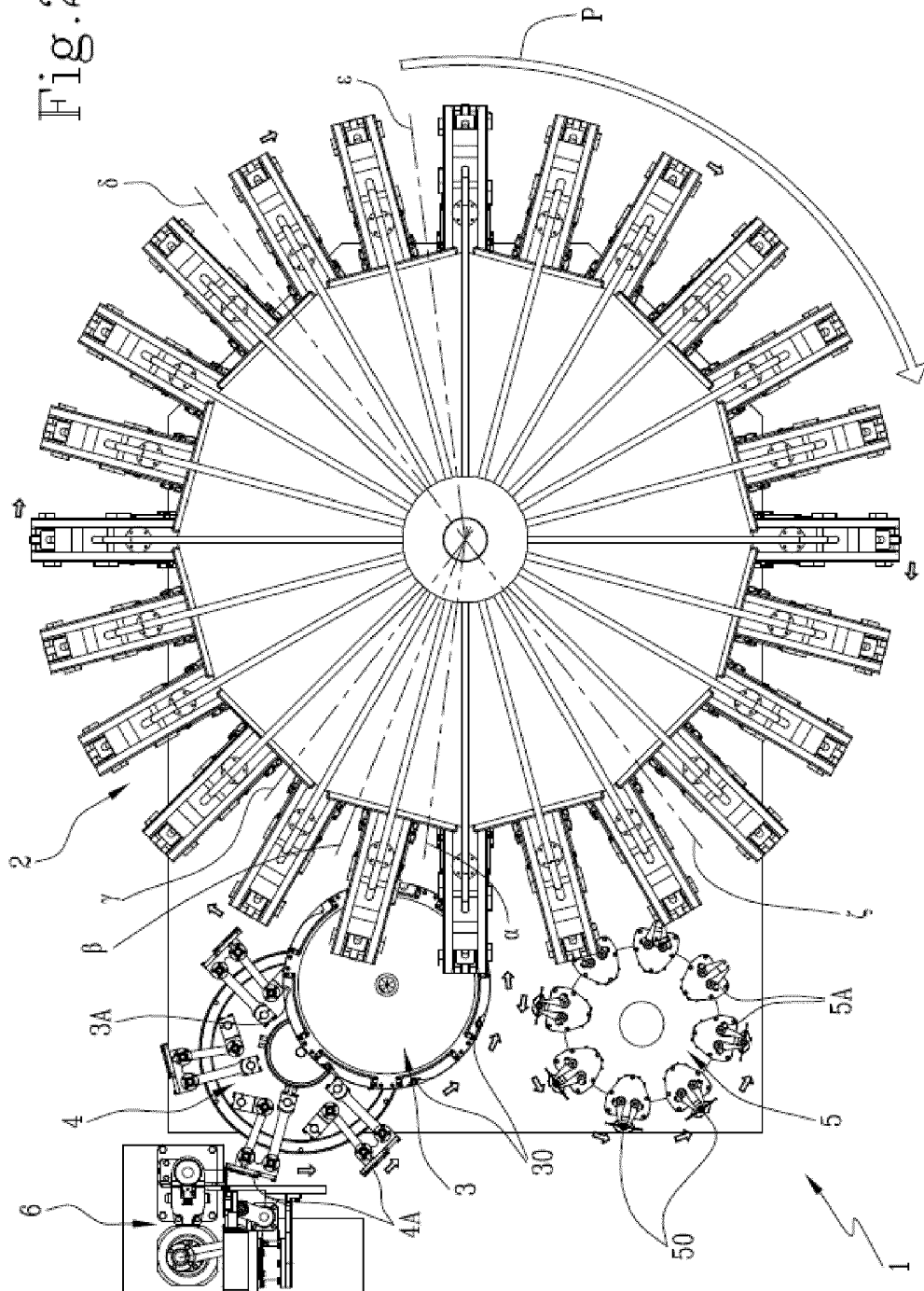
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Fig.3

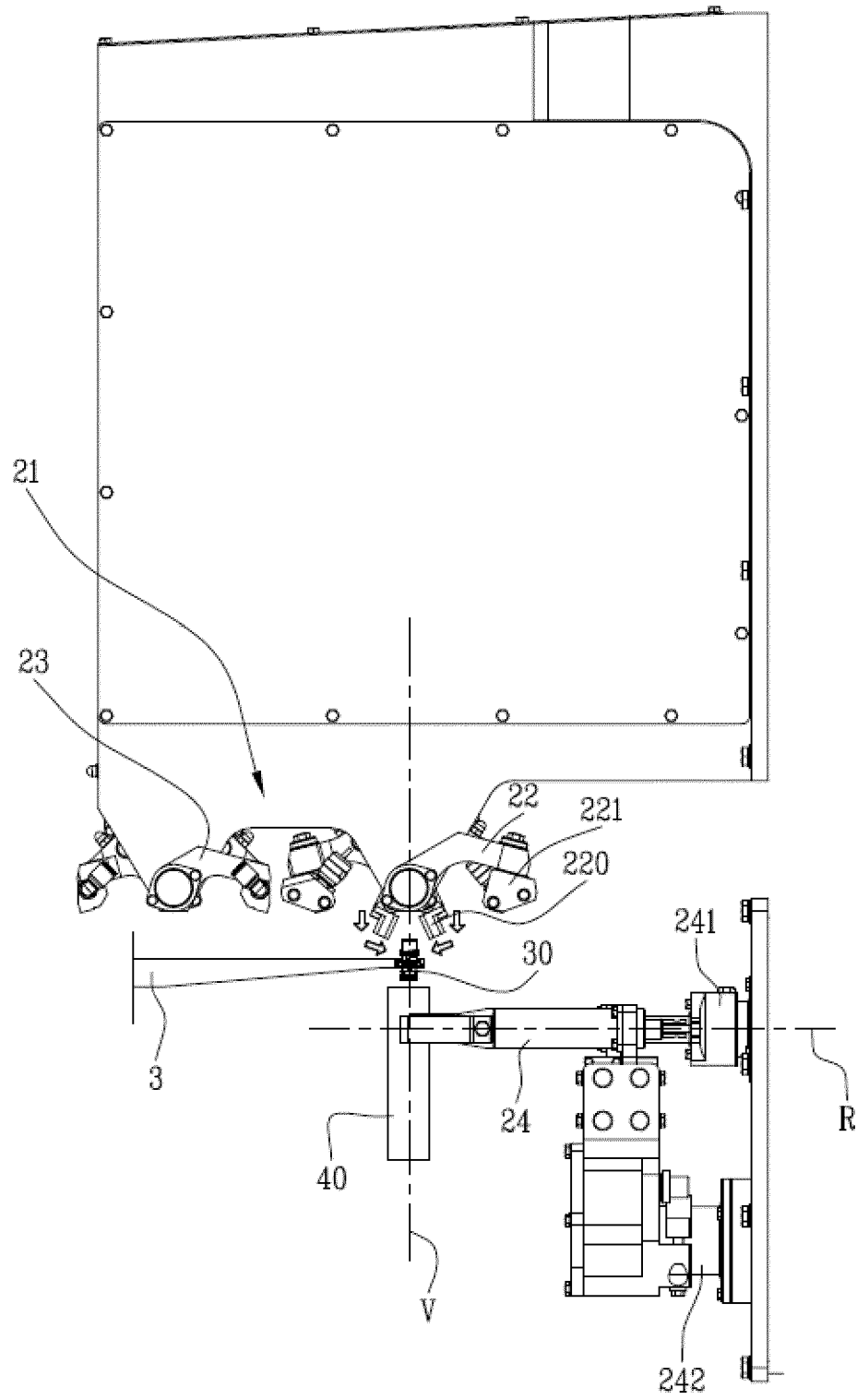


Fig.4

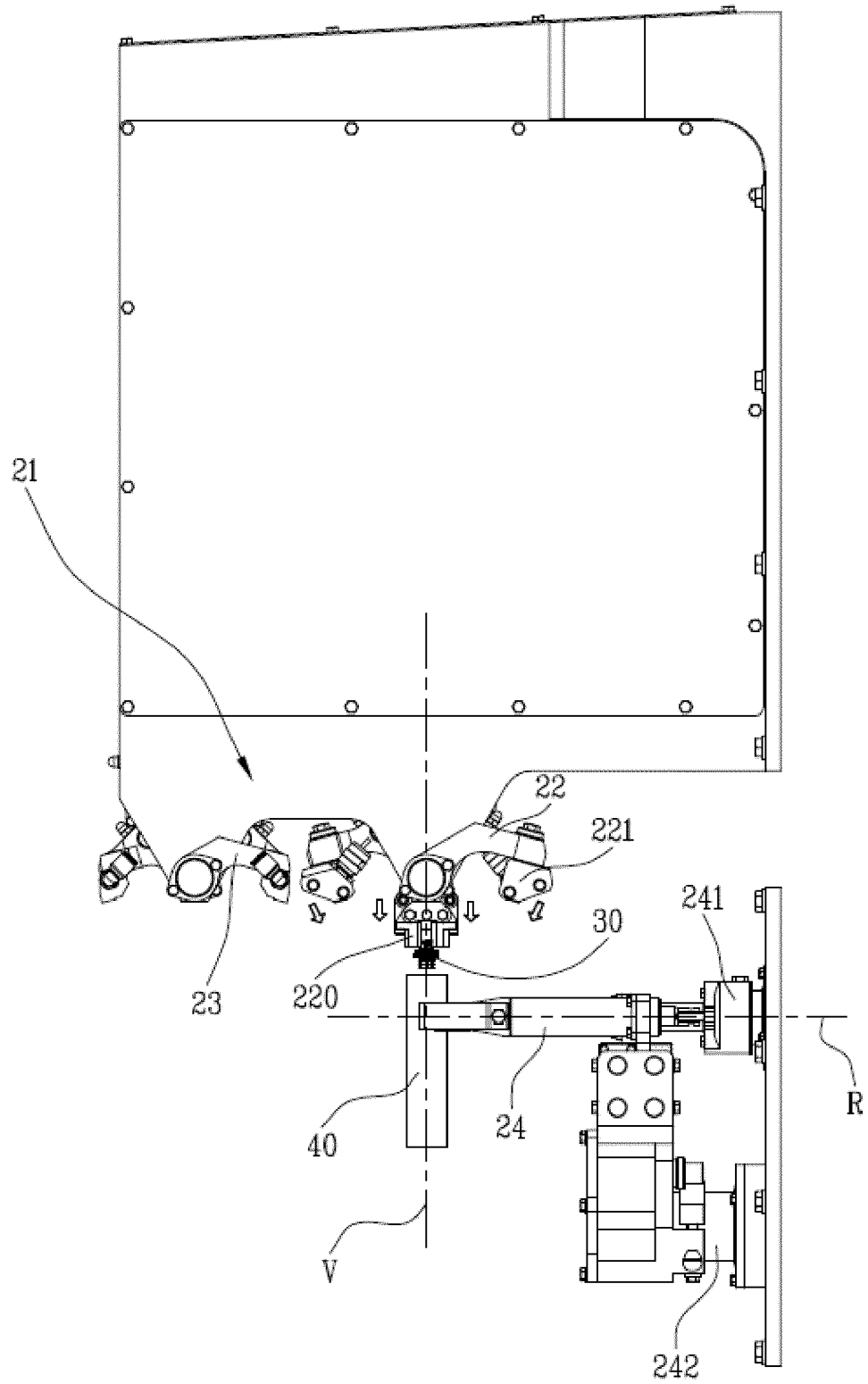


Fig.5

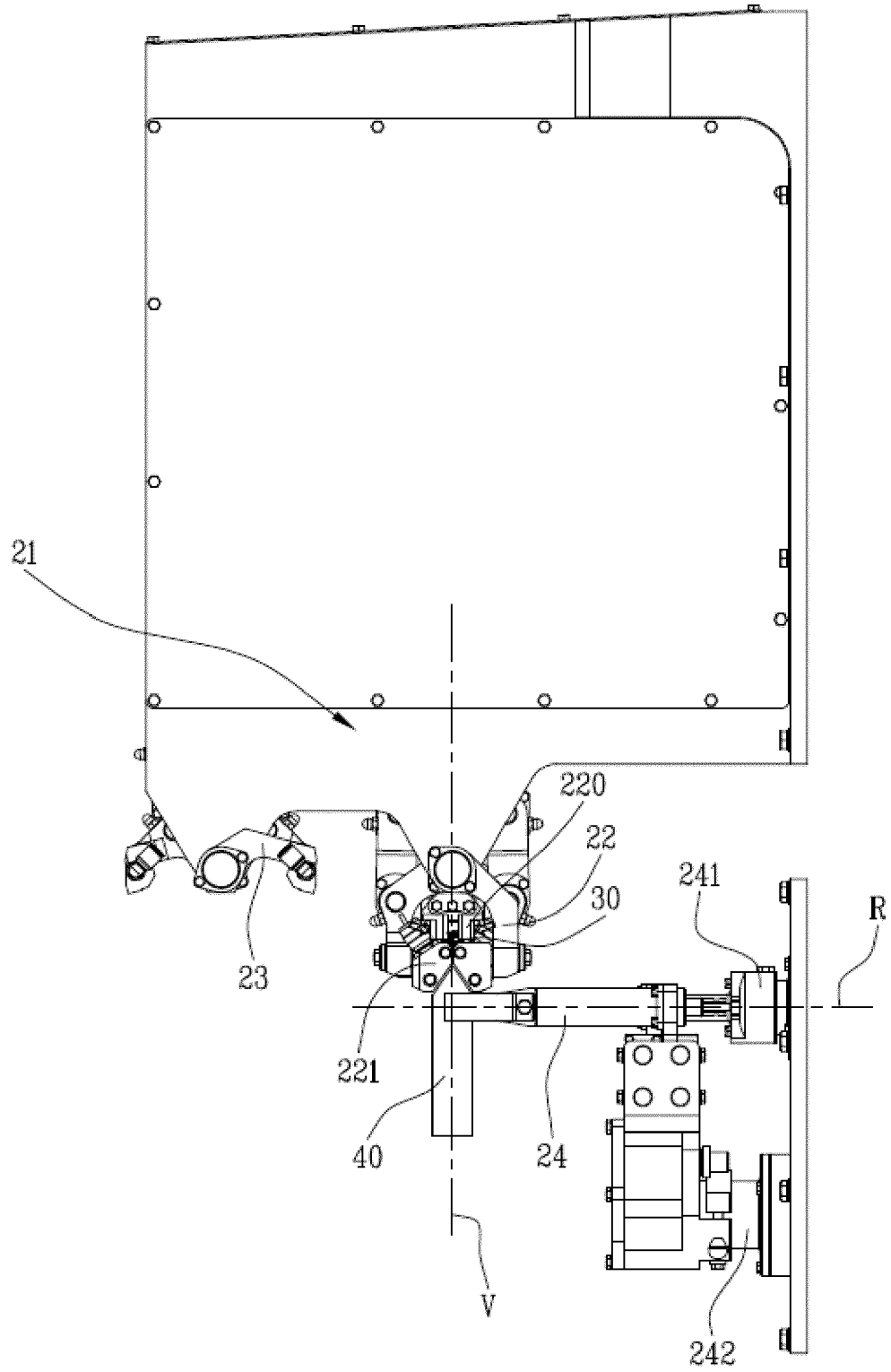


Fig.6

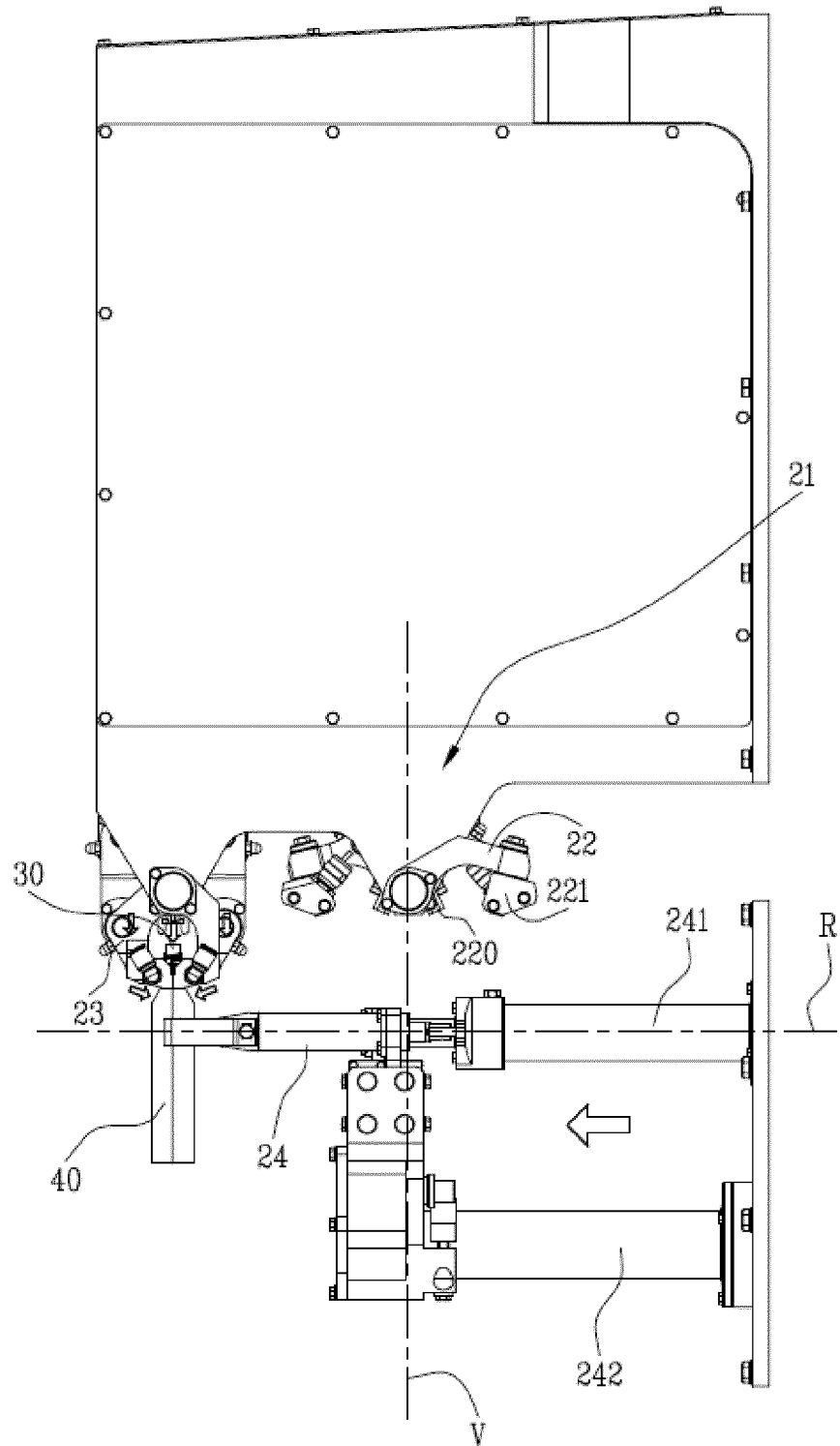


Fig.7

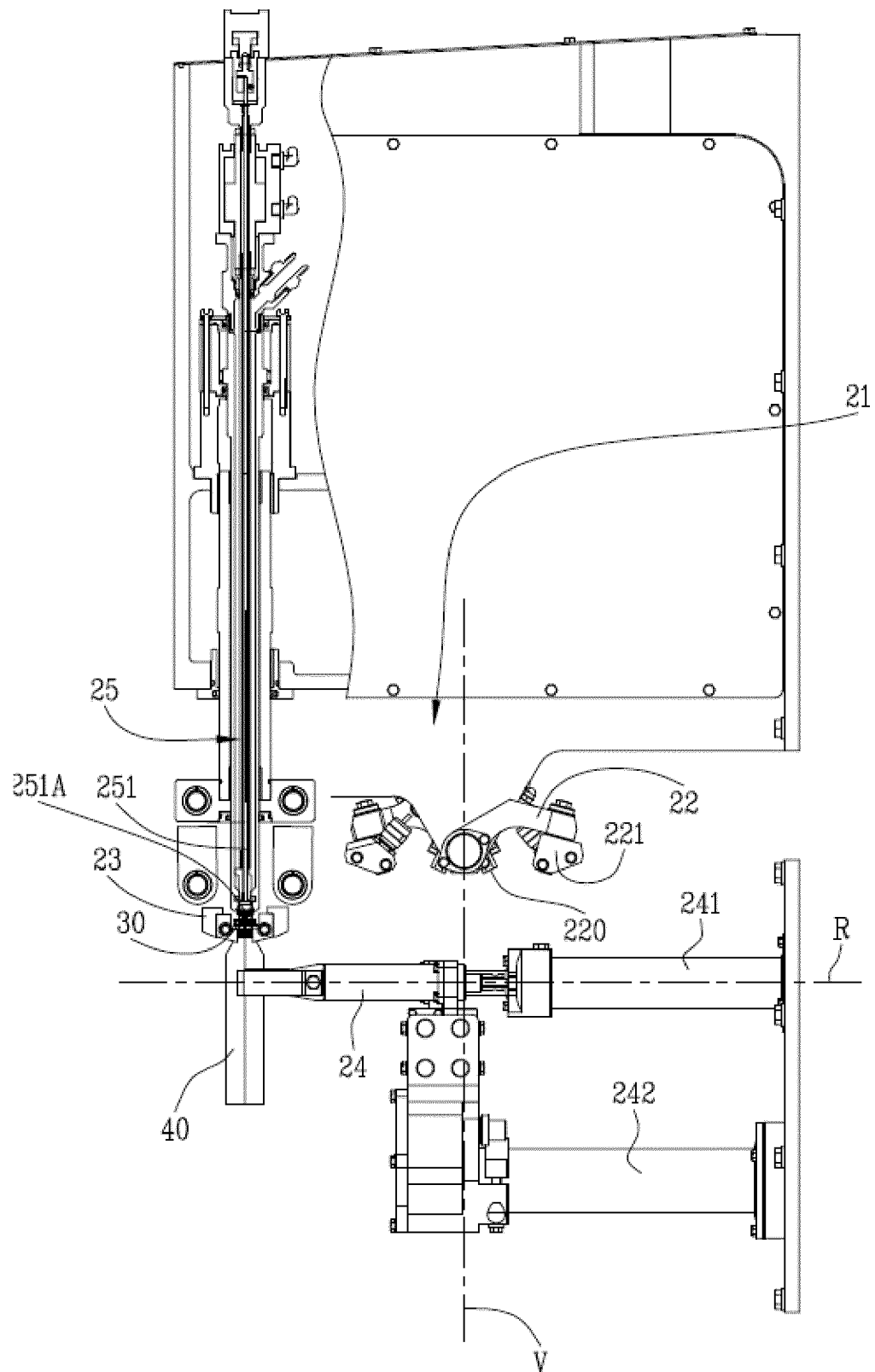


Fig.8

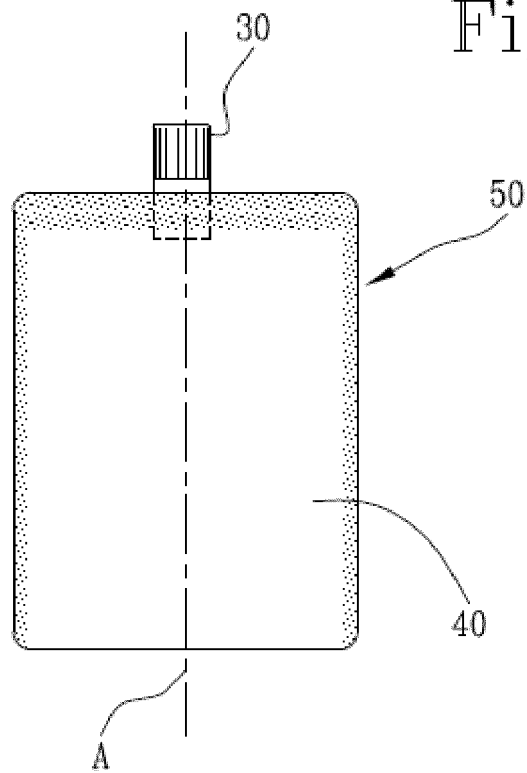
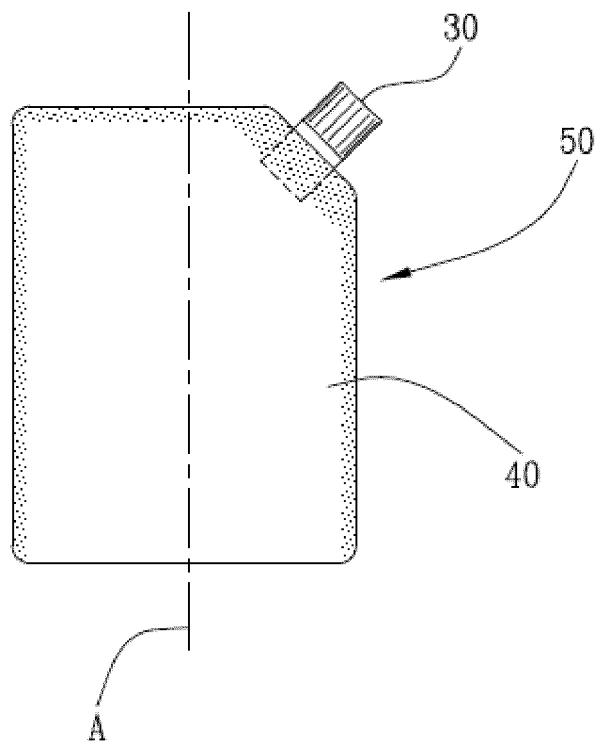


Fig.9





EUROPEAN SEARCH REPORT

 Application Number
 EP 18 18 9526

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2005/014399 A1 (SUNSTAR INC [JP]; DAIWA CAN CO LTD [JP]; SHIN NIPPON KOKI CO LTD [JP];) 17 February 2005 (2005-02-17) * the whole document *	1-16	INV. B65B39/00 B65B43/26 B65B43/60 B65B7/28 B65B37/08 B65B61/18 B65B39/14 B65B43/50
A	EP 2 746 175 A1 (TETRA LAVAL HOLDINGS & FINANCE [CH]) 25 June 2014 (2014-06-25) * the whole document *	1-16	
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A,D	EP 3 257 764 A1 (VOLPAK S A U [ES]) 20 December 2017 (2017-12-20) * the whole document *	1-16	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 28 November 2018	Examiner Yazici, Baris
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REFERENCES CITED IN THE DESCRIPTION

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