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

(11) **EP 3 569 510 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.11.2019 Bulletin 2019/47

(21) Application number: **19174847.4**

(22) Date of filing: **16.05.2019**

(51) Int Cl.:
B65B 35/16 *(2006.01)* ***B65B 39/12*** *(2006.01)*
B65B 39/14 *(2006.01)* ***B65B 43/60*** *(2006.01)*
B65B 9/087 *(2012.01)* ***B65B 29/02*** *(2006.01)*

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

(30) Priority: **17.05.2018 JP 2018095106**

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(54) FILLING AND PACKAGING MACHINE

(57) A filling and packaging machine capable of rapidly inserting an inner bag formed by a three-way seal inside an outer bag formed by a three-way seal. The filling and packaging machine 10 is provided with an inner-bag packaging machine 12 and an outer-bag packaging machine 14. The inner-bag packaging machine 12 is provided with a product-filling machine 18 forming an inner bag B1 from an inner-bag web S1 folded in half and filling the inner-bag web with product deposited from the top. The outer-bag packaging machine 14 forms an outer bag B2 from an outer-bag web S2 folded in half and inserts the inner bag B1 from the top. The outer-bag packaging machine 14 is arranged downstream of the inner-bag packaging machine and is provided with a plurality of grippers gripping the inner bags B1, a linking mechanism conveying the grippers to track the outer bags B2, and a cam mechanism raising and lowering the grippers. The grippers hold the cut inner bags B1 while being lowered and while tracking the outer bags B2 to thereby insert the inner bags B1 into the outer bags B2.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a filling and packaging machine placing an inner bag formed by a three-way seal inside of an outer bag formed by a three-way seal.

2. Description of the Related Art

[0002] For teabags or other such products, it is known to individually package a mesh-shaped inner bag containing tea leaves, etc., inside of an air-tight outer bag (Japanese Patent No. 5230659). The filling and packaging device described in Japanese Patent No. 5230659 produces inner bags by conveying downward a long packaging material folded into half along the longitudinal direction while sealing the lateral side part (side seal) to thereby form the inner bag packaging material into a tubular shape, horizontally seals the tubular-shaped packaging material at constant intervals, and then fills the spaces between them with tea leaves before cutting off the sections to form tea bags. The tea bags drop down into the outer-bag production process that begins with a long outer-bag packaging material that is folded in two and intermittently conveyed in the horizontal direction. The top and both sides of the outer bag packaging material are sealed and the sealed parts are cut on both sides, thereby individually packaging the tea bags in the outer bags and doubly packaging the tea leaves inside the inner and outer bags.

SUMMARY OF THE INVENTION

[0003] However, with the configuration of Japanese Patent No. 5230659, the directions of conveyance of the inner and outer bags perpendicularly intersect, so suitably inserting the inner bags into the outer bags requires intermittent conveyance, which makes it difficult to accelerate the production process.

[0004] The present invention is confronted with the technical problem of increasing the rate at which a filling and packaging machine inserts an inner bag formed by a three-way seal into an outer bag formed by a three-way seal.

[0005] According to a first aspect of the present invention, there is provided a filling and packaging machine comprising an inner-bag web conveying means, an inside-bag folding means, an inner-bag side-sealing means, a product-filling means, an inner-bag top-sealing means, an inner-bag cutting means, an outer-bag web conveying means, an outer-bag folding means, an outer-bag side-sealing means, an inner-bag inserting means, and an outer-bag top-sealing means.

[0006] The inner-bag web conveying means conveys an inner-bag web. The inside-bag folding means folds the inner-bag web in half. The inner-bag side-sealing means seals the folded inner-bag web at predetermined intervals in the conveyance direction at the sides of the inner bags. The product-filling means fills the folded inner-bag web with a product deposited from above. The inner-bag top-sealing means seals the top of the inner-bag web in which the product is filled. The inner-bag cutting means cuts the side-sealed locations of the inner-bag web. The outer-bag web conveying means conveys an outer-bag web. The outer-bag folding means folds the outer-bag web in half. The outer-bag side-sealing means seals the folded outer-bag web at predetermined intervals in the conveyance direction at the sides of the outer bags. The inner-bag inserting means inserts cut-off inner bags from the top of the folded outer-bag web. The outer-bag top-sealing means seals the top of the outer-bag web in which the inner bags are inserted. The inner-bag inserting means comprises a plurality of holding parts holding inner bags, a holding-part conveying means for conveying the holding parts to track the outer bags, and a holding-part elevating means for raising and lowering the holding parts. The holding parts holds and conveys the inner bags before the inner bags are cut by the inner-bag cutting means and lowering the inner bags while tracking the outer bags after the inner bags are cut off, thereby inserting the inner bags into the outer bags.

[0007] According to a second aspect of the present invention, there is provided a filling and packaging machine according to the first aspect of the invention wherein the holding-part conveying means is provided with a pitch- widening mechanism for widening the pitch of the holding parts and the holding parts are widened in pitch so that the inner bags after being cut have the same pitch as the outer bags.

[0008] According to a third aspect of the invention, there is provided a filling and packaging machine according to the first or second aspect of the invention wherein the inner-bag inserting means is provided with a rotating member in which the outer-bag side-sealing means and the inner-bag inserting means are arranged along its circumference. Further, the inner-bag web conveying means conveys the inner-bag web before cutting toward a tangential direction of the rotating member and the inner-bag cutting means is arrange at the point of contact between the inner-bag web and the rotating member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a perspective view of a filling and packaging machine according to one embodiment of the present invention;

Fig. 2 is a partial side cross-sectional view of the filling and packaging machine of Fig. 1;

Fig. 3 is a partial side cross-sectional view of a product filling machine;

Fig. 4 is a view showing the operation of the side seal section to the first half of the inserting section of the inside bag inserting machine laid out to the outside in the diametrical direction:
Fig. 5 is an enlarged view of a section A3 (see Fig. 2) of Fig. 4;
Fig. 6 is a partial side cross-sectional view of an inside bag inserting machine;
Figs. 7A and 7B show the configuration of an inside of a gripper operating mechanism;
Fig. 8 is a plan view of a link mechanism; and
Fig. 9 is a view showing the movement around the point of contact P of the link mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] Below, an embodiment of the present invention will be explained with reference to the drawings. Fig. 1 is a perspective view of a filling and packaging machine according to an embodiment of the present invention, while Fig. 2 is a plan view.

[0011] The filling and packaging machine 10 of the present embodiment is provided with an inner bag packaging machine 12 and an outer bag packaging machine 14. At the inner bag packaging machine 12, a long belt-shaped inner bag web (belt-shaped film) S1 is fed out from an inner bag material feeder 16 and supplied to a product-filling machine (product filling means) 18. The inner bag web S1 is fed out from a stock roll 16A installed on the inner bag material feeder 16, rendered horizontal at a guide roller 16B, and folded upward in half from a center crease along the longitudinal direction to be supplied to the product-filling machine 18 (inner-bag folding means).

[0012] The product-filling machine 18 is provided with a rotating member 18A rotating about a vertical axis. The inner bag web S1 folded in half is run along the outer circumferential edge of the rotating member 18A in synchronization with the rotation of the rotating member 18A. The inner bag web S1 folded in half and wound around the rotating member 18A is vertically sealed (side seal) at set intervals in an upstream section (side-seal section) A1 along the longitudinal direction of the web whereby it is formed into bag shapes with open tops (inner-bag side seal means).

[0013] Above the outer circumference of the rotating member 18A, hoppers 18B are arranged corresponding to the inner bags B1 formed by the side seals of the inner-bag web S1. The hoppers 18B are lowered and inserted inside the corresponding inner bags B1 at a downstream section (filling section) A2 following the upstream section A1 of the rotating member 18A whereupon the inner bags B1 are filled with contents deposited from above. When filling is completed, the hoppers 18B are raised and the inner bag web S1, which is divided in the longitudinal direction by the side seals into a large number of inner bags B1 filled with content, separates from the rotating member 18A and is fed out through the guide roller 20 toward the outer bag packaging machine 14.

[0014] The inner bag web S1 passing the guide roller 20 is fed out straight toward the outer bag packaging machine 14 and passed through a preheater 22 and top seal device (inner-bag top seal means) 24 where the opened top side of the folded inner bag web S1, that is, the part formed with the openings of the inner bags B1, is preheated along the longitudinal direction and the openings are completely sealed by the top seal device 24. Due to this, the contents filled in the inner bags B1 formed from the inner bag web S1 are sealed inside the inner bags B1.

[0015] At the downstream end of the inner-bag web S1, a cutter (inner-bag cutting means) 26 is arranged at a position adjoining the outer-bag packaging machine 14. The inner bags B1 of the inner-bag web S1 in which the contents are filled and sealed are individually cut off at their downstream side seal end positions by the cutter 26 to be separated into individual inner bags B1. The inner bags B1 separated from the inner-bag web S1 are, as explained later, held by a mechanism provided at the outer-bag packaging machine 14 and individually inserted into outer bags B2.

[0016] At the outer-bag packaging machine 14, a long belt-shaped outer-bag web S2 is fed out from an outer-bag feeder 28 and supplied to an inner-bag inserting machine (inner-bag inserting means) 30. The outer-bag web S2 is fed out from a stock roll 28A installed at the outer-bag feeder 28, rendered horizontal at a guide roller 28B, and folded upward in half from a center crease along the longitudinal direction to be supplied to the inner-bag inserting machine 30 (outer-bag folding means).

[0017] The inner-bag inserting machine 30 is provided with a rotating member 30A rotating about a vertical axis. The outer bag web S2, folded in half, is run along the outer circumferential edge of the rotating member 30A in synchronization with the rotation of the rotating member 30A. The outer-bag web S2 folded in half and wound around the rotating member 30A is vertically sealed (side seal) at set intervals in an upstream section (side-seal section) A3 along the longitudinal direction of the web whereby it is formed into bag shapes with open tops (outer-bag side seal means).

[0018] The inner bag web S1 fed out straight from the guide roller 20 toward the outer-bag packaging machine 14 is arranged tangentially with respect to the outer circumference of the rotating member 30A of the inner-bag inserting machine 30. Furthermore, the cutter 26 is arranged so as to cut the inner-bag web S1 at a position substantially corresponding to the point of contact P with the rotating member 30A. Hoppers 30B, which are inserted into the outer bags B2 to guide the inner bags B1 into the outer bags B2, and inner-bag holding devices 32, which hold the cut inner bags B1 and insert them into the corresponding hoppers 30B (see Fig. 4, Fig. 6, and Figs. 7A and 7B), are arranged above the outer circumference of the rotating member 30A corresponding to the outer bags B2 with the capability of being raised and low-

ered.

[0019] The inner bags B1 cut by the cutter 26 and held by the inner-bag holding devices (holding-part conveying means) 32 of the inner-bag inserting machine 30 are, as explained later, inserted at the downstream section (inserting section) A4 through the hoppers 30B into the outer bags B2, which were formed at the upstream section (side seal section) A3. After the inner bags B1 are inserted, the hoppers 30B are raised and retracted from the outer bags B2, whereupon the direction of the outer-bag web S2 is changed by the guide roller 34 and, in the same way as the inner-bag web S1, sealed at its top openings by a preheater 36 and top seal device (outer-bag top seal means) 38 whereby the inner bags B1 are sealed inside the outer bags B2. After being sealed, the outer-bag web S2 is cut by the cutter 40 at the side seal positions, whereby the individual packaging of the inner bags B1 within the outer bags B2 is completed.

[0020] Next, referring to the side cross-sectional view of the product-filling machine 18 of Fig. 3, the configuration of the product-filling machine 18 will be explained in more detail.

[0021] The rotating member 18A of the product-filling machine 18 is provided with a disk-shaped base board 180 attached through a bearing 181 around a fixed shaft 182 to be able to rotate. The base board 180 is rotated by a drive mechanism (not shown) in synchronization with the speed of conveyance of the inner-bag web S1. Arranged at set intervals along the outer circumference around the base board 180 is a plurality of side seal parts 184 over the outer cirumferences of which the folded inner-bag web S1 is strung.

[0022] Each side seal part 184 is provided with a fixed seal bar 184A standing upright from the base board 180 and a swinging seal bar 184B positioned outside of the fixed seal bar 184A and having a base end part rotatably supported at an outer circumferential edge of the base board 180. The swinging seal bar 184B can swing between a prone state in which its front end faces radially outward and a standing state where it stands upright and is pressed against the fixed seal bar 184A. The swinging motion of the swinging seal bar 184B about the base end part is controlled by the engagement of a cam follower 184D and cam groove 184C provided at the front end of a pivoting lever 184E for pivoting the swinging seal bar 184B.

[0023] The inner-bag web S1 is designed to run in a state pressed against the fixed seal bar 184A. If the swinging seal bar 184B is stood upright and pressed against the fixed seal bar 184A across the inner-bag web S1, the folded inner-bag web S1 is gripped between the fixed seal bar 184A and swinging seal bar 184B to be melted and thereby sealed with a side seal. In Fig. 3, the left side shows a swinging seal bar 184B in the prone state, while the right side shows a swinging seal bar 184B in the standing state.

[0024] Above the side seal parts 184 and in the interval between two adjacent side seal parts 184, hoppers 18B are arranged. Each hopper 18B is supported by a hopper-elevating mechanism 186. The hopper 18B is supported at the top end of an elevating shaft 186A extending in the vertical direction of the hopper-elevating mechanism 186. The elevating shaft 186A is supported to be raised and lowered with respect to the base board 180 and is raised and lowered by engagement between a cam follower 186B and cam 186C provided at the bottom end of the elevating shaft 186A. In Fig. 3, the left side shows the state where a hopper 18B is raised and the right side shows the state where the hopper 18B is lowered with its front end inserted inside an inner bag B1 formed by a side seal of the inner-bag web S1.

[0025] Arranged above the rotating member 18A is a tank 188 in which the content to be filled inside the inside bags B1 is stored. Above each hopper 18B, a filling nozzle 188A is provided for guiding the content from inside the tank 188 to the hopper 18B. At the filling section A2, the content inside the tank 188 falls through the filling nozzles 188A and hoppers 18B into the inner bags B1.

[0026] Next, referring to Figs. 4 and 5, the operation for inserting an inner bag B1 into an outer bag B2 at the inner-bag inserting machine 30 will be explained. Fig. 4 shows the operation of the section from the side seal section (upstream section) A3 of the inner-bag inserting machine 30 to the first half of the inserting section (downstream section) A4, while Fig. 5 is an enlarged view of the section A4 of Fig. 4.

[0027] As shown in Fig. 4, hoppers 30B are successively inserted from above into the outer-bag web S2 folded in half. At the side-seal section (upstream section) A3, hoppers 30B are inserted from above into the outer-bag web S2 along the rear edge side seals L of the immediately preceding inserted hoppers 30B. Afterward, the rear edge sides of the newly inserted hoppers 30B are sealed and the next hoppers 30B are similarly inserted into the outer-bag web S2 along the side seals L.

[0028] Above the outer-bag web S2 into which the hoppers 30B are inserted and divided into individual outer bags B2 by side seals, the sealed inner-bag web S1 divided into inner bags B1 is conveyed from the tangential direction of the outer circumference of the inner-bag inserting machine 30. The inner-bag web S1 is gripped by grippers (holding parts) 32A of the inner-bag holding devices 32 successively at the tops of the inner bags B1 in front of the point of contact P where the outer circumference of the inner-bag inserting machine 30 and the straight trajectory of the inner-bag web S1 make contact with each other. Near the point of contact P, the cutter 26 cuts the inner bag B1 from the inner-bag web S1 at the front end. At this time, the grippers 32A individually grip the inner bags B1 moving along the tangential direction in front of the point of contact P using linking mechanisms (described later) that protrude the grippers 32A radially outward from the outer circumference of the inner-bag inserting machine 30 and rotate so as to become parallel to the tangential direction.

[0029] Furthermore, while holding the inner bags B1

until the inner bags B1 are cut, the grippers 32A are given pitches matching the pitch D1 of the inner bags B1 formed from the inner-bag web S1, but after cutting, are given pitches D2 of the outer bags B2 formed from the outer-bag web S2, that is, the pitch of the hoppers 30B. Afterward, the grippers 32A are pulled radially inward and rotated to orientations following the outer circumference of the inner-bag inserting machine 30 to be returned to their original positions and orientations. That is, the grippers 32A move along the outer circumference of the inner-bag inserting machine 30 together with the hoppers 30B, that is, the outer bags B2.

[0030] The grippers 32A starting to move along the outer circumference of the inner-bag inserting machine 30 are lowered to release at least part of the held inner bags B1 into the hoppers 30B positioned directly below them. Due to this, the inner bags B1 drop down through the interiors of the hoppers 30B and are deposited into the outer bags B2 into which the hoppers 30B are inserted.

[0031] Furthermore, each hopper 30B is provided with a tube 30C for injecting nitrogen gas or other inert gas inside the outer bag B2. The nitrogen gas is injected inside the outer bag B2 while the hopper 30B is inserted inside the outer bag B2. The hopper 30B is raised and retracted from the outer bag B2 before the outer packaging film S2 reaches the guide roller 34. Afterward, the hopper 30B and gripper 32A are moved along the outer circumference of the inner-bag inserting machine 30. When reaching the above-mentioned point of contact P, a similar operation is repeated.

[0032] Fig. 6 is a partial side cross-sectional view of the inner-bag inserting machine 30 of the present embodiment. The inner-bag inserting machine 30 is provided with a fixed part 300 including a rotational shaft 300A and a rotating part 302 rotating about the rotational shaft 300A through a bearing 301. The rotating part 302 is provided with a base board 308, on which a side-seal part 304 and hopper-elevating mechanism 306 holding the hoppers 30B are arranged along the outer circumference, and a holding device support part 310 supporting the inner-bag holding devices 32.

[0033] The rotating part 302 is rotated by a drive mechanism (not shown) in synchronization with the speed of conveyance of the outer bag web S2. Arranged at set intervals along the outer circumference around the base board 308 is a plurality of side-seal parts 304 over the outer circumferences of which the folded outer bag web S2 is strung. Each side-seal part 304 is provided with a fixed seal bar 304A standing upright from the base board 308 and a swinging seal bar 304B positioned outside of the fixed seal bar 304A and having a base end part rotatably supported at the outer circumferential edge of the base board 308.

[0034] Each swinging seal bar 304B can swing between a prone state, where its front end faces radially outward, and a standing state, where it stands upright and is pressed against the fixed seal bar 304A. The swinging motion of the swinging seal bar 304B about the base end part is controlled by the engagement of a cam follower 304D and cam groove 304C provided at the front end of a pivoting lever 304E for pivoting the swinging seal bar 304B.

[0035] The outer bag web S2 is run in a state pressed against the fixed seal bar 304A. If the swinging seal bar 304B is standing upright and pressed against the fixed seal bar 304A across the outer bag web S2, the folded outer bag web S2 is gripped between the fixed seal bar 304A and the swinging seal bar 304B and melted, thereby creating a side seal. Fig. 6 shows the swinging seal bar 304B in the prone state.

[0036] Above the side seal parts 304 and in the interval between every two adjacent side seal parts 304, hoppers 30B are respectively arranged. Each hopper 30B is supported by a hopper-elevating mechanism 306. The hopper 30B is supported at a top end of an elevating shaft 306A extending in the vertical direction of the hopper-elevating mechanism 306. The elevating shaft 306A is supported to be able to be raised and lowered with respect to the base board 308 and is raised and lowered by the engagement of a cam follower 306B and cam 306C provided at the bottom end of the elevating shaft 306A. Fig. 6 shows the state where a hopper 30B is lowered with its front end inserted into an outer bag B2 formed from the outer bag web S2.

[0037] Above each hopper 30B, an inner-bag holding device 32 is arranged and supported by a holding device support part 310. The inner-bag holding device 32 is provided with a gripper operating mechanism 320 opening and closing a gripper 32A. The gripper operating mechanism 320 is attached to the bottom end of a vertically extending slide shaft 322. The slide shaft 322 can be raised and lowered with respect to the block 324. The block 324 houses a linking mechanism (pitch-widening mechanism; explained later) 42 inside it and is supported by a link box 326 held at the holding device support part 310. Note that, the linking mechanism 42, which is driven by the engagement of the three cam followers 42A, 42B, and 42C connected to the linking mechanism 42 and the cam grooves 42D, 42E, and 42F provided at the fixed part 300 along its entire circumference, controls the position and orientation of the block 324, that is, the slide shaft 322.

[0038] The slide shaft 322, for example, is provided with a cam follower 322A near its top end. The cam follower 322A is engaged with a gripper-elevating cam 300B provided along the outer circumference of the fixed part 300. That is, the slide shaft 322 is raised and lowered with respect to the block 324 (holding part elevating means) by rotation of the rotary part 302 and movement of the cam follower 322A along the shape of the gripper-elevating cam 300B.

[0039] Furthermore, the slide shaft 322 has a hollow structure into which an elevating shaft 328 for operating the gripper 32A is inserted. A top end of the elevating shaft 328 is provided with a cam follower 328A that is engaged with a gripper-operating cam 300c provided

along an outer circumference of the fixed part 300. That is, the elevating shaft 328 is raised and lowered inside the slide shaft 322 by rotation of the rotary part 302 and movement of the cam follower 328A along the shape of the gripper-operating cam 300c. The bottom end of the elevating shaft 328, as explained later, is connected to the gripper-operating mechanism 320. The operation of the gripper 32A is performed by the vertical (up and down) motion of the elevating shaft 328.

[0040] Referring to Figs. 7A and 7B, the operation of a gripper 32A will be explained. Figs. 7A and 7B show the configuration of the inside of the gripper-operating mechanism 320. Fig. 7A is a side view of the internal structure of the gripper-operating mechanism 320 as seen from inside the inner bag inserting machine 30 in the radial direction, while Fig. 7B is a side view of the internal structure of the gripper-operating mechanism 320 from the direction shown in Fig. 6.

[0041] The gripper-operating mechanism 320 is covered by a cover 320A. The cover 320A is fixed to the bottom end part of the slide shaft 322. At the bottom end part of the slide shaft 322, a bushing 322B is interposed between the outer circumferential surface of the elevating shaft 328 and the inner circumferential surface of the slide shaft 322. At the bottom end of the elevating shaft 328, a base member 328B is fixed. The base member 328B is provided with a guide rod 328C parallel to the elevating shaft 328. The guide rod 328C, which is inserted through a bushing 328E inside a bore 328D provided integrally at the cover 320A, guides the elevating action of the base member 328B by the elevating shaft 328.

[0042] At the bottom side of the base member 328B, a downward-protruding operating cam 328F is provided. The operating cam 328F engages with a pair of gripper pieces 320B and 320C forming a gripper 32A. The gripper pieces 320B and 320C are supported through bushings 320E around a rotational shaft 320D fixed to the cover 320A horizontally. The two are biased in a direction closing them by biasing members (not shown). The end parts at the base-part sides of the gripper pieces 320B and 320C (top end parts) are provided with cam followers 320F and 320G, respectively.

[0043] The operating cam 328F is inserted between the cam followers 320F, 320G. If the base member 328B is lowered by the elevating shaft 328, the cam followers 320F and 320G are pushed apart against the biasing forces of the biasing members and the gripper pieces 320B and 320C are opened. If the elevating shaft 328 is raised from this state, the base member 328B is raised, the cam followers 320F and 320G approach each other due to the biasing forces, and the gripper pieces 320B and 320C are closed.

[0044] Next, referring to Fig. 8 and Fig. 9, the structure and operation of the linking mechanism 42 in the block 324 will be explained. Fig. 8 is a plan view of one linking mechanism 42, while Fig. 9 is a view showing the movement of the linking mechanism 42 near the point of contact P.

[0045] The slide shaft 322 is configured to slide against the block 324 in the up-down direction and rotate together with it in the rotational direction. The block 324 is provided with a first link 421, second link 422, and third link 423. The links 421, 422, and 423 are respectively comprised of pairs of first and second levers (421A, 421B), (422A, 422B), and (423A, 423B). The first ends of the first levers 421A, 422A, and 423A of the links 421, 422, and 423 are respectively supported by the fixed shafts 421C, 422C, and 423C at the housing of the linking mechanism 42, for rotation.

[0046] One end of the second lever 421B of the first link 421 and one end of the second lever 422B of the second link 422 are attached through the shafts 421D and 422D to the block 324, for rotation. On the other hand, one end of the second lever 423B of the third link 423 is supported through the shaft 423D at the second lever 422B of the second link 422. Furthermore, the other ends of the first levers 421A, 422A, and 423A and the other ends of the second levers 421B, 422B, and 423B are connected to be rotated by the shafts 421E, 422E, and 423E for movement in the respective horizontal planes. Note that, in Fig. 8, the point Q shows the reference point corresponding to the center position of the gripper 32A.

[0047] The fixed shafts 421C, 422C, and 423C are respectively integrally provided with operating levers 425, 426, and 427 (see Fig. 6 and Fig. 9). The front ends of the operating levers 425, 426, and 427 are respectively provided with cam followers 42A, 42B, and 42C (see Fig. 6 and Fig. 9). If, along with the rotation of the rotary member 302, the cam followers 42A, 42B, and 42C respectively move along the cam grooves 42D, 42E, and 42F, the fixed shafts 421C, 422C, and 423C are rotated and the first link 421, second link 422, and third link 423 are respectively driven.

[0048] Due to the rotation of the fixed shafts 421C and 422C, the block 324, that is, the reference point Q, is retracted in the radial direction of the rotating member 302 (arrow A). Due to the rotation of the fixed shaft 423C, the angle of the block 324, that is, the angle of the gripper 32A with respect to the radial direction (or the tangential direction) is adjusted (arrow B).

[0049] The plan view of Fig. 9 shows the arrangement of the four linking mechanisms 42 near the point of contact P (alternately drawn by the solid lines and two-dot chain lines). In Fig. 9, the arrow C shows the running position and running direction of the inner-bag web S1, while the arrow D shows the rotational direction of the rotating member 302. As shown in Fig. 9, the linking mechanism 42 at the position (a) pushes the block 324 outward in the radial direction and rotates its orientation counterclockwise so that the corresponding gripper 32A can grip the inner-bag web S1 conveyed straight in the arrow C direction.

[0050] The grippers 32A connected to the linking mechanisms 42 at the positions (b) and (c), respectively, grip the tops of the inner bags B1 of the inner-bag web

S1 at the pitch D1 and move straight along the arrow C direction without changing orientation. That is, the linking mechanisms 42 at the positions (b) and (c) are driven so that the positions and orientations of the grippers 32A change in this way.

[0051] When the cutter 26 cuts off an inner bag B1 from the inner-bag web S1, the linking mechanism 42 returns the gripper 32A to the reference position and orientation. That is, the pitch of the reference point Q is widened to D2 and the gripper 32A is maintained at the outer circumference position of the rotating member 302. Further, the orientation of the gripper 32A is maintained so that the gripped inner bag B1 follows along the circumferential direction (tangential direction) of the rotating member 302. The position and orientation of the gripper 32A are maintained by the linking mechanism 42 until the gripper 32A again reaches the position (a).

[0052] Downstream of the position (d), the gripper 32A gripping the inner bag B1 is lowered while tracking the hopper 30B inserted into the outer bag B2. When the gripper 32A releases the inner bag B1, the inner bag B1 passes through the hopper 30B positioned below it and is deposited into the outside bag B2. Afterward, the gripper 32A is raised together with the hopper 30B to its original height and is moved toward the position (a) along with the rotation of the rotating member 302.

[0053] In this way, according to the present embodiment, a section can be provided where the inner bags and the inner-bag holding devices (grippers) of the inner-bag inserting machine run in parallel so that inner bags can be transferred from the product-filling machine to the inner-bag inserting machine continuously at a high speed. Due to this, the inner bags can be inserted at a high speed into the outer bags.

[0054] Note that, in the present embodiment, the product-filling machine and the inner-bag inserting machine are both circular-shaped rotating circulating types of machines, but they are not limited to circular shapes so long as they are circulating types of machines provided with sections where the inner bags and the inner-bag holding parts of the inner-bag inserting machine run in parallel. Furthermore, in the present embodiment, grippers are used for the inner-bag holding devices, but the holding parts may also be suction types.

[0055] Note that, as examples of the contents filled inside the inner bags, powdered soup stock, tea leaves, etc., may be mentioned. In this case, the inner-bag web is made from a material capable of being extracting the content component, while the outer-bag web is made from an airtight material for sealing the inner bags. However, the contents and the materials of the inner-bag web and the outer-bag web are not limited to these options. The present invention can be applied to any contents and materials for double packaging using inner bags and outer bags formed by three-way seals.

[0056] Although the embodiments of the present invention have been described herein with reference to the accompanying drawings, obviously many modifications and changes may be made by those skilled in this art without departing from the scope of the invention.

Claims

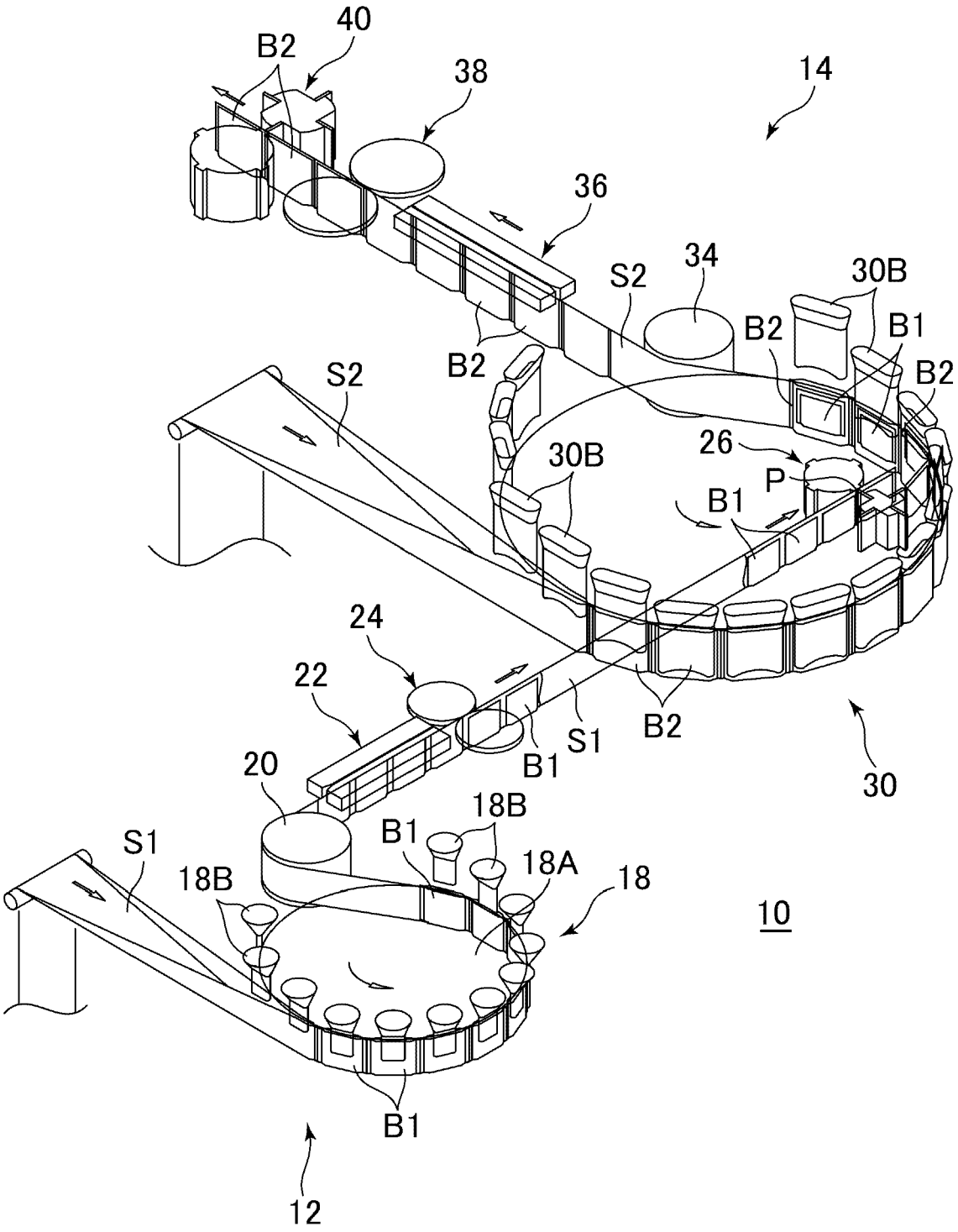
1. A filling and packaging machine comprising
an inner-bag web conveying means for conveying an inner-bag web;
an inner-bag folding means for folding the inner-bag web in half;
an inner-bag side-sealing means for sealing the folded inner-bag web at predetermined intervals in the conveyance direction at the sides of the inner bags;
a product-filling means for filling the folded inner-bag web with a product deposited from above;
an inner-bag top-sealing means for sealing the top of the inner-bag web in which the product is filled;
an inner-bag cutting means for cutting the side-sealed locations of the inner-bag web;
an outer-bag web conveying means for conveying an outer-bag web;
an outer-bag folding means for folding the outer-bag web in half;
an outer-bag side-sealing means for sealing the folded outer-bag web at predetermined intervals in the conveyance direction at the sides of the outer bags;
an inner-bag inserting means for inserting cut-off inner bags from the top of the folded outer-bag web; and
an outer-bag top-sealing means for sealing the top of the outer-bag web in which the inner bags are inserted;
the inner-bag inserting means comprising a plurality of holding parts holding inner bags, a holding-part conveying means for conveying the holding parts to track the outer bags, and a holding-part elevating means for raising and lowering the holding parts;
the holding parts holding and conveying the inner bags before the inner bags are cut by the inner-bag cutting means and lowering the inner bags while tracking the outer bags after the inner bags are cut off, thereby inserting the inner bags into the outer bags.

2. A filling and packaging machine according to claim 1, wherein
the holding-part conveying means is provided with a pitch-widening mechanism for widening the pitch of the holding parts and
the holding parts are widened in pitch so that the inner bags after being cut have the same pitch as the outer bags.

3. A filling and packaging machine according to claim 1 or 2 wherein
the inner-bag inserting means is provided with a rotating member in which the outer-bag side-sealing

means and the inner-bag inserting means are arranged along its circumference; and
the inner-bag web conveying means conveys the inner-bag web before cutting toward a tangential direction of the rotating member and the inner-bag cutting means is arrange at the point of contact between the inner-bag web and the rotating member.

FIG. 1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14
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S2
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B2
B1
B2
S2
B2
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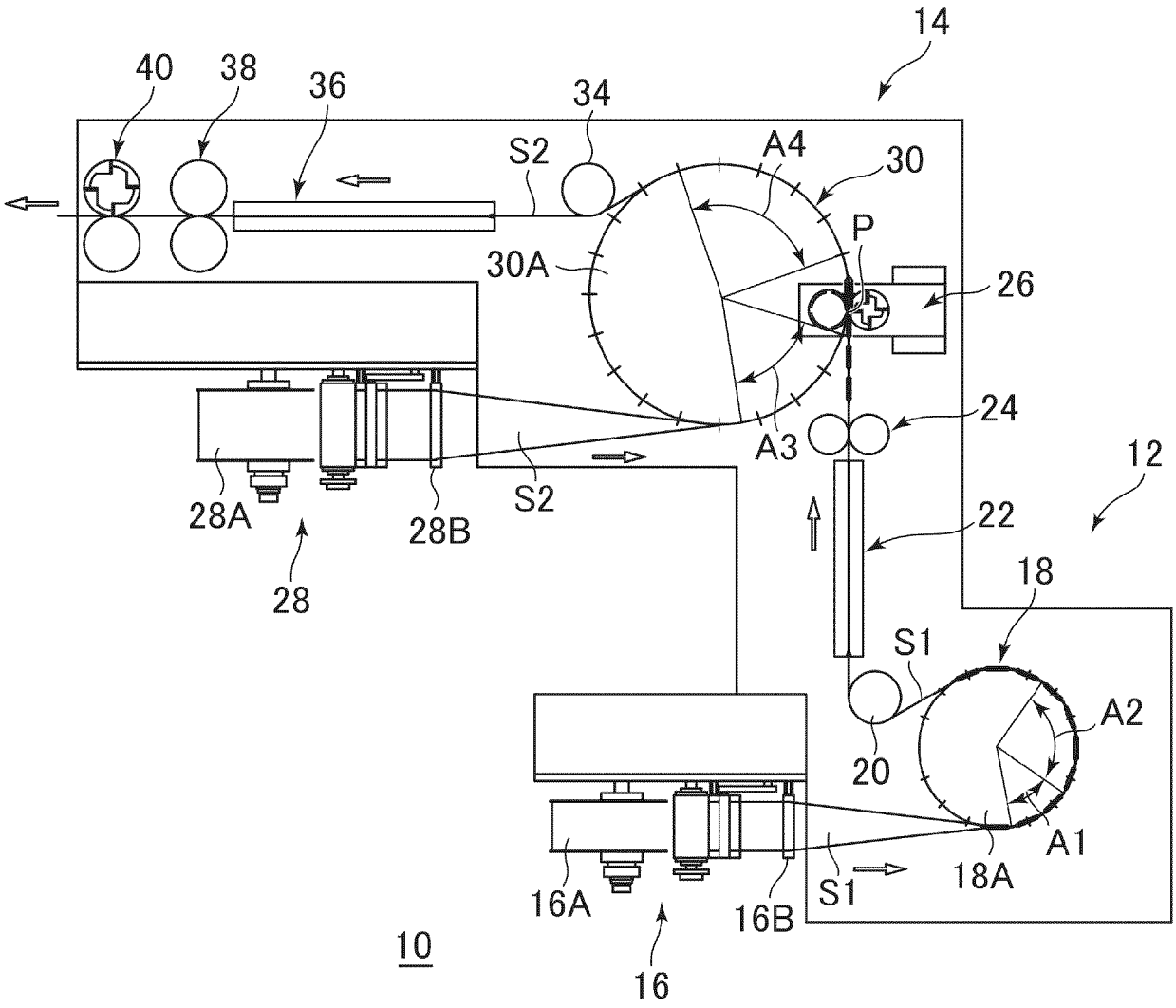
P
B1
24
22
S1
B2
B1
30
20
18B
B1
S1
18B
18A
18
10
B1
12

FIG. 2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S2
A4
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P
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26
24
A3
12
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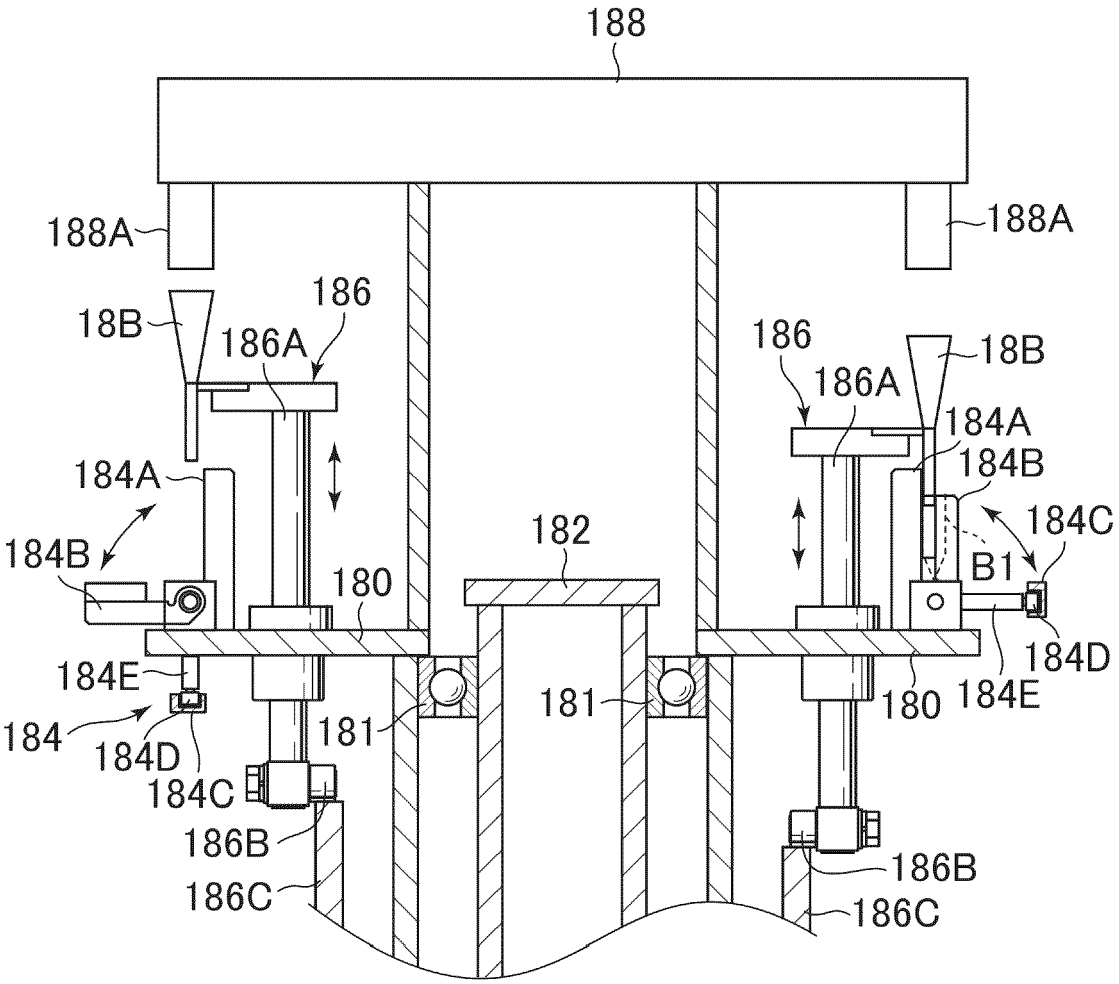
S2
28
18
S1
A2
20
A1
18A
16A
16B
S1
10
16

FIG. 3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18B
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18B
186A
184A
184A
184B
184B
184C
182
B1
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184D
184E
184
184D
184C
181
181
180
184E
186B
186C
186B
186C

18

FIG. 4

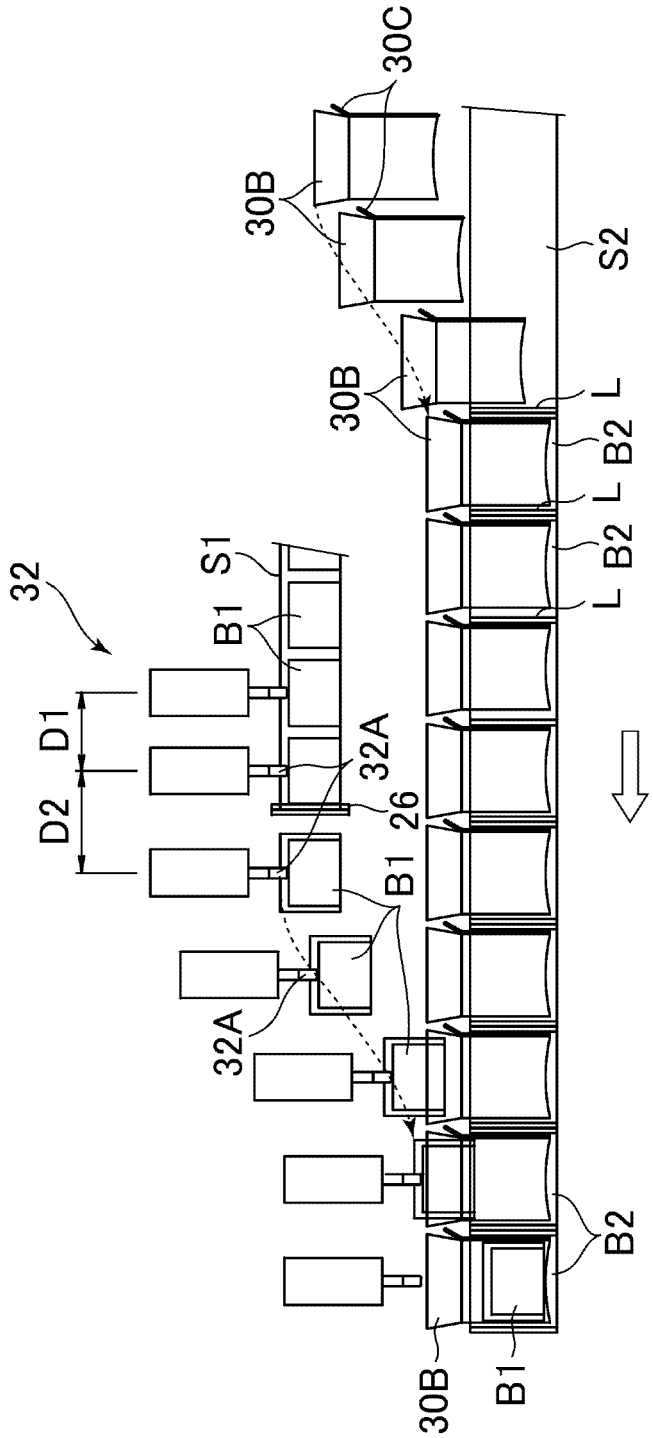


FIG. 5

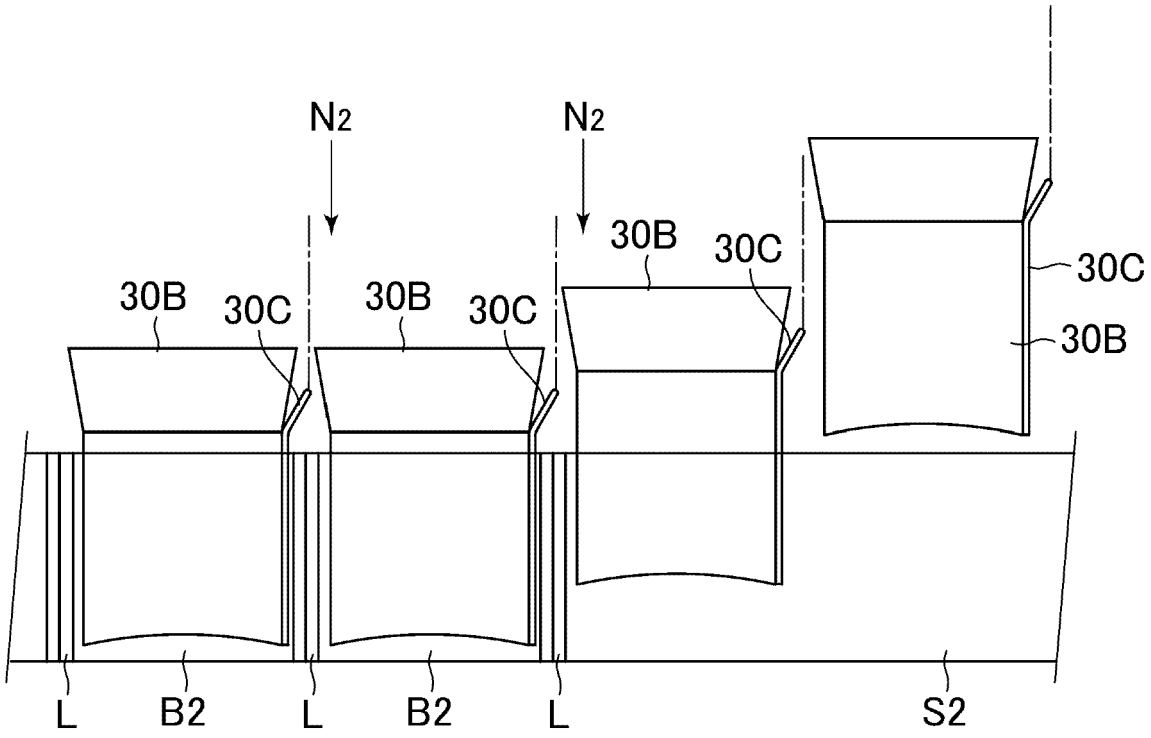
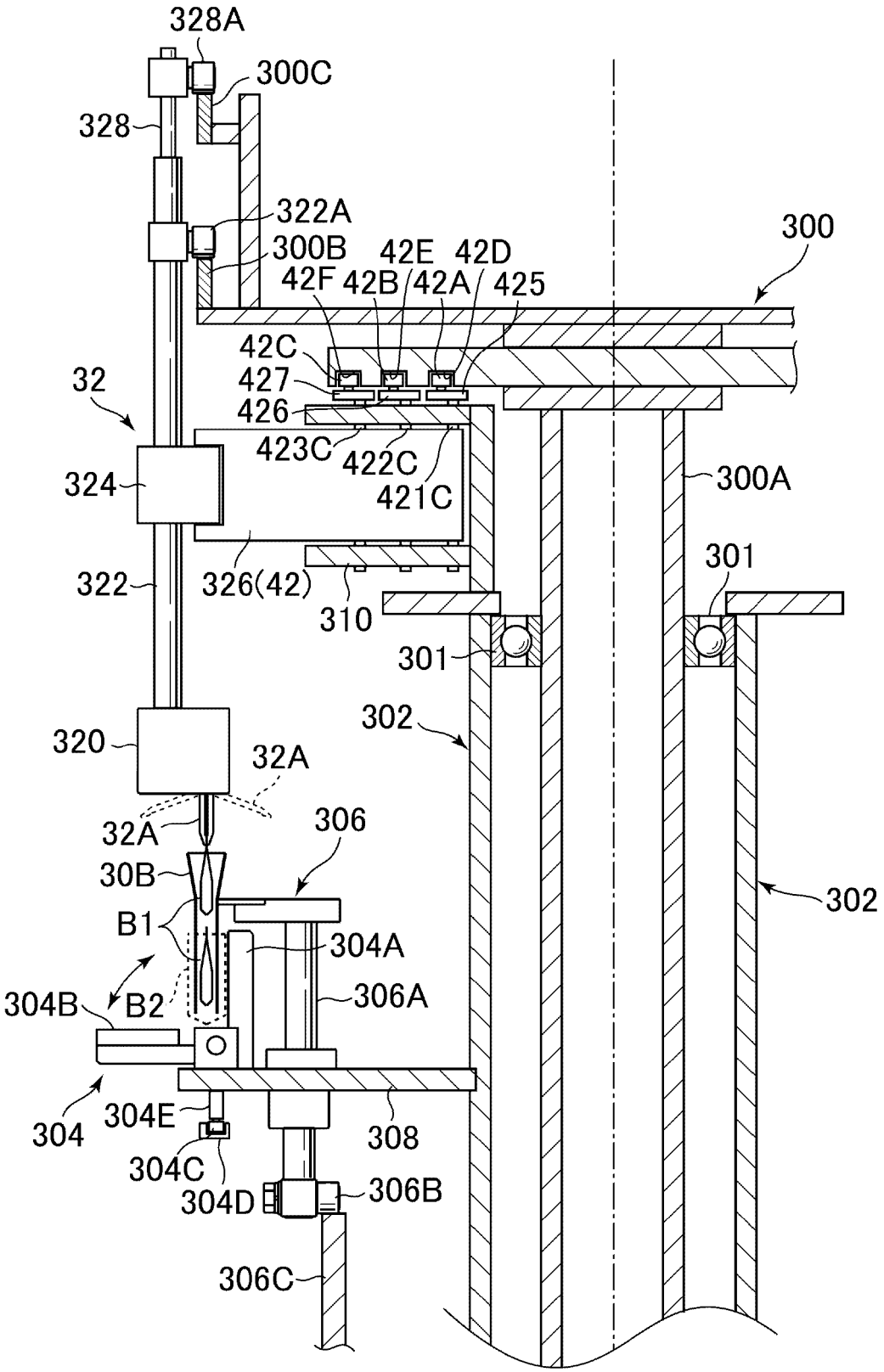


FIG. 6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300B
42E
42D
42F
42B
42A
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42C
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32
423C
422C
421C
324
300A
322
326(42)
310
301
301
302
320
32A
32A
306
30B
B1
304A
304B
B2
306A
302
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304E
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304C
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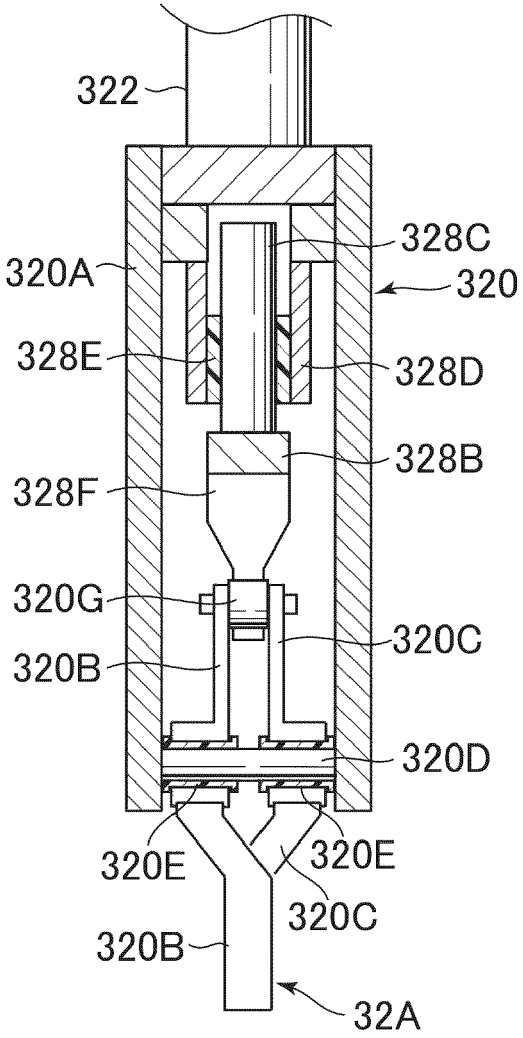
306B
306C

FIG. 7A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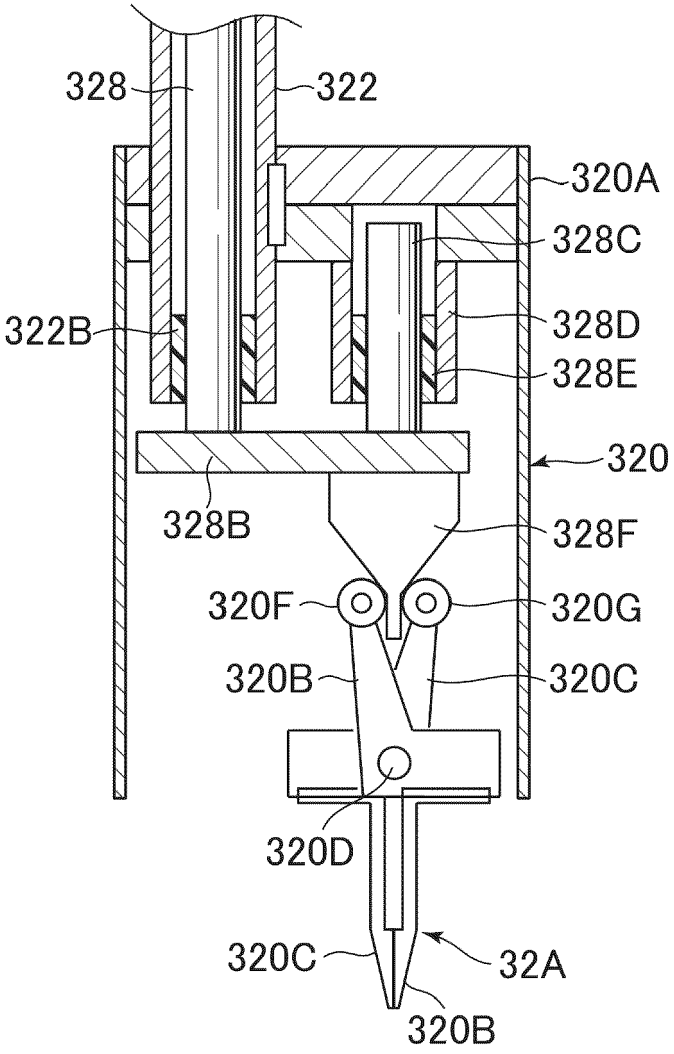
320B
32A

FIG. 7B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322B
328D
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320D
320C
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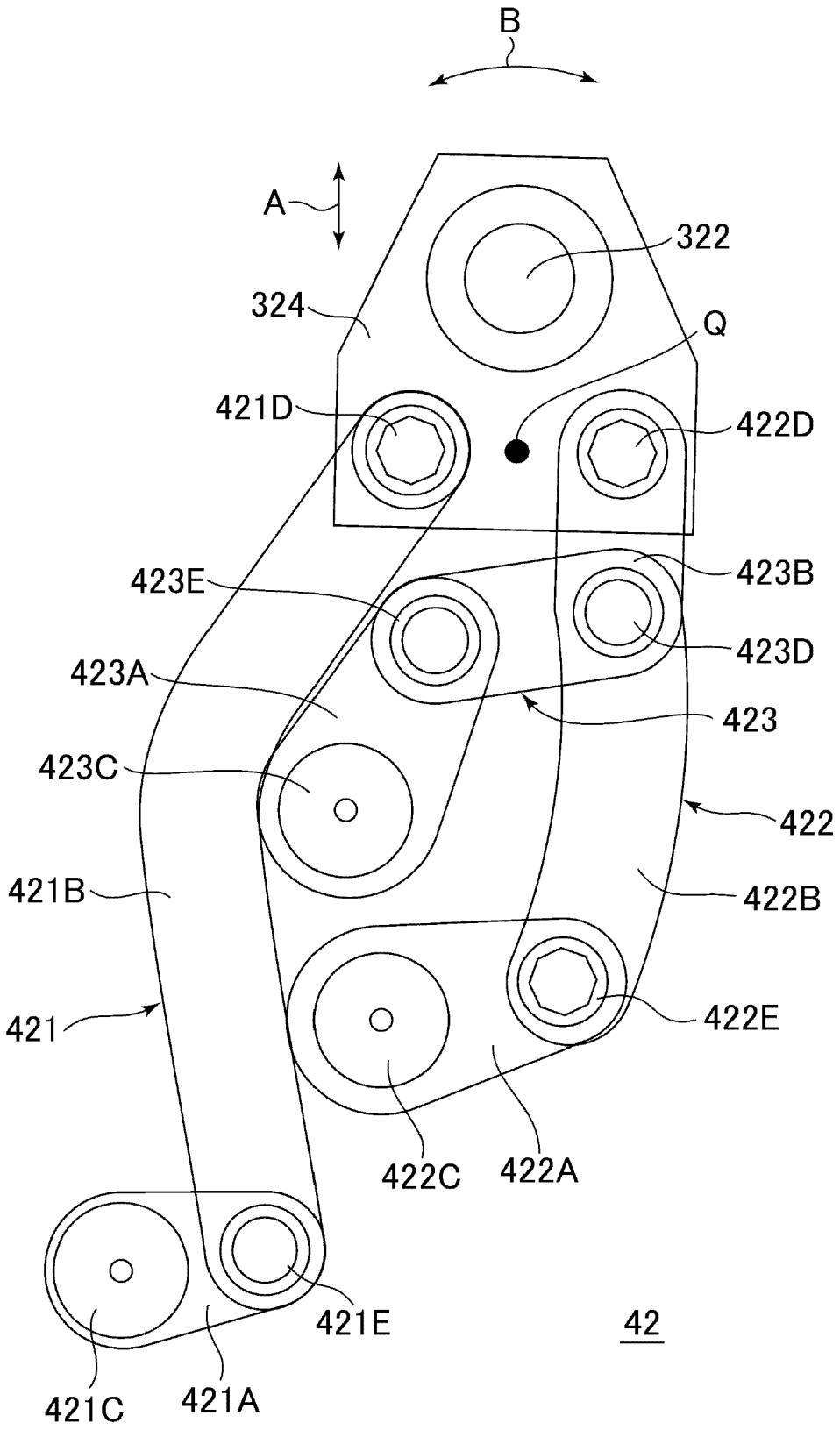
320B

(b)

FIG. 8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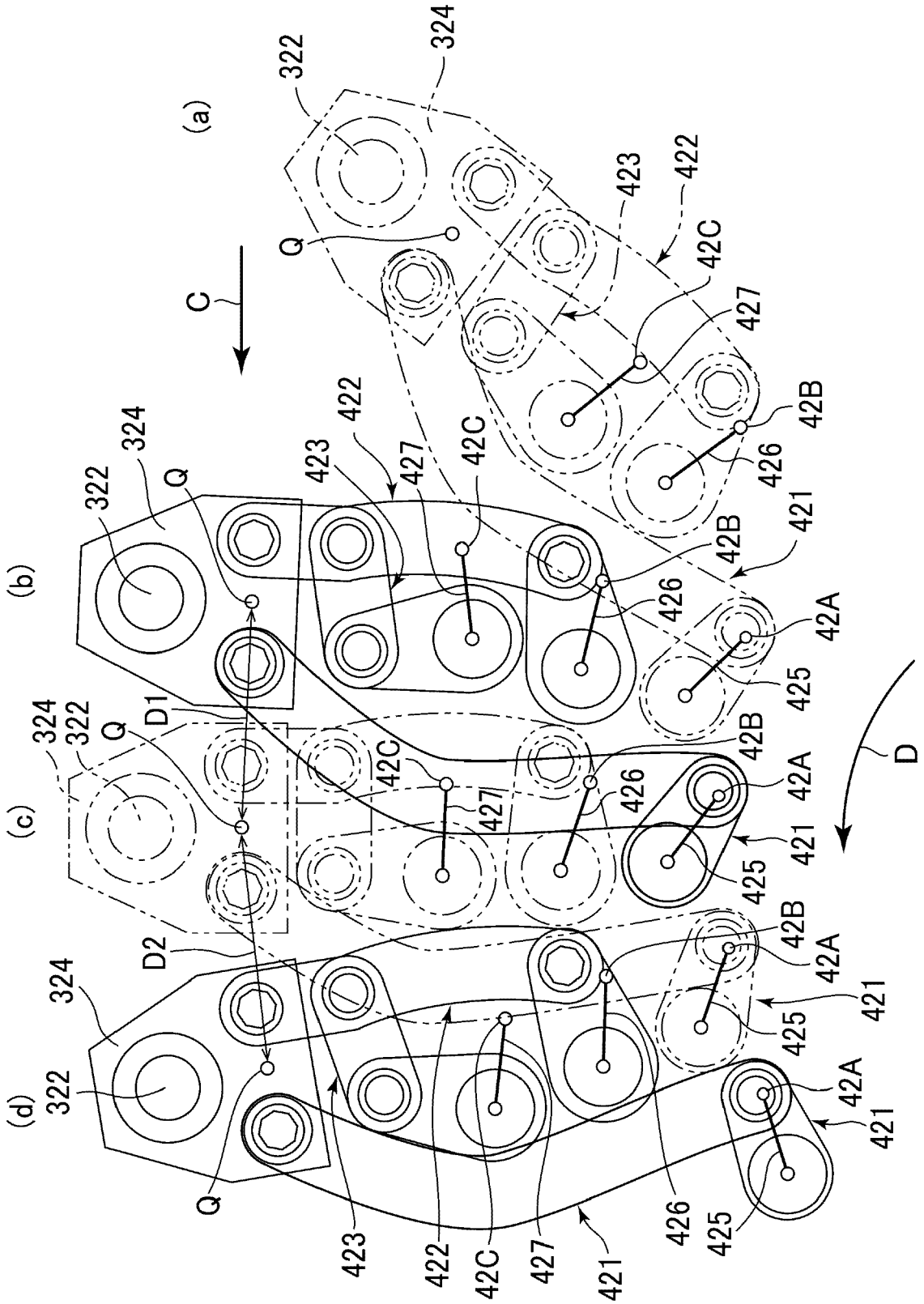
422C
422A
421E
42
421C
421A

FIG. 9



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Application Number
EP 19 17 4847

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A	WO 2011/048653 A1 (OHKI CO LTD [JP]; TSUBAKIMOTO KOGYO CO LTD [JP] ET AL.) 28 April 2011 (2011-04-28) * paragraph [0036]; figures 1-2 *	1-3	INV. B65B35/16 B65B39/12 B65B39/14 B65B43/60 B65B9/087 B65B29/02
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B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 July 2019	Garlati, Timea

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