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(54) **FILLING/PACKAGING METHOD AND FILLING/PACKAGING MACHINE**

(57) To provide a filling and packaging method and a filling and packaging machine that can reliably eliminate a risk of inclusion of bacteria in a content filled in a tubular packaging material even when a vertical sealing failure occurs in a connection portion of a web-like packaging material. The filling and packaging method includes: detecting whether a connection portion W10 of a web-like packaging material W has passed through a predetermined position in a movement path of the web-like packaging material W; reducing a supply amount of a content into a tubular packaging material T based on detected passage information of the connection portion W10, to reduce a content filling level in the tubular packaging material T from a normal position L1 above a pressure flange 18 to a negative pressure occurrence avoidance position L2 below the pressure flange 18 before the connection portion W10 reaches an expected negative pressure occurrence area A where a negative pressure is likely to occur along with pulling-down of the tubular packaging material T by a pair of sealing jaws 161; and returning the content filling level from a negative pressure occurrence avoidance position L3 to the normal position L1 after the connection portion W10 passes through the expected negative pressure occurrence area A.

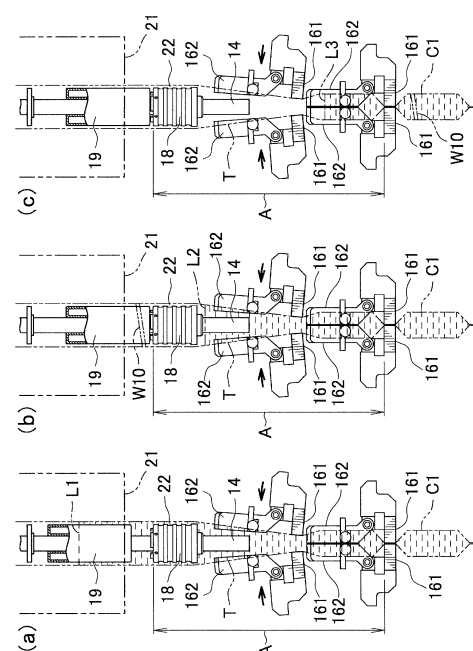


FIG. 3

Description

Technical Field

[0001] The present invention relates to a filling and packaging method and a filling and packaging machine for filling and packaging a content such as a fluid food and a beverage in a container formed of a web-like packaging material such as paper.

Background Art

[0002] For example, filling and packaging machines shown in FIG. 5 and FIG. 6 are generally known (see PTL 1 and PTL 2 below) as a filling and packaging machine for manufacturing a paper-forming container filled with a content such as a fluid food.

[0003] This filling and packaging machine (10) includes a rewinder (11) supporting a web-like packaging material (W) that is wound into a roll shape, a rewinding device (12) that sequentially rewinds the web-like packaging material (W) from the rewinder (11), a tube forming device (13) that forms a tubular packaging material (T) by overlapping and vertically sealing both edges of the rewound web-like packaging material (W), a content filling device (15) that fills the tubular packaging material (T) with a content by a filling tube (14) inserted from above into the tubular packaging material (T), a container forming device (16) that forms a pillow-shaped content filling container (C1), which is in an intermediate form, by horizontally sealing the tubular packaging material (T) filled with the content in a length corresponding to one container and cutting the sealed tubular packaging material (T) in the middle of a width of a horizontally sealed portion, and a container completing device (17) that forms the container (C1) into a rectangular content filling container (C2), which is in a completed form.

[0004] The container forming device (16) is provided with two pairs of sealing jaws (161) that are arranged in an openable and closable manner with the tubular packaging material (T) sandwiched therebetween, sandwiches to pull the tubular packaging material (T) down, and horizontally seals the tubular packaging material (T). The sealing jaws (161) are alternately moved up and down in pairs with a stroke corresponding to the length of one container (C1).

[0005] As shown in FIG. 6, each pair of sealing jaws (161) is usually provided with forming flaps (162) that pre-form the tubular packaging material (T) into a predetermined container shape (for example, a square cross section) by sandwiching the tubular packaging material (T) from both sides thereof. In FIG. 6, only one pair of sealing jaws (161) is shown, and the other pair of sealing jaws is omitted.

[0006] A float (19) is provided around the filling tube (14) so as to be slidable along a length direction of the filling tube (14). The float (19) moves up and down according to a fluctuation of a content filling level (L) in the

tubular packaging material (T), and constitutes a part of a device that detects the content filling level (L) and keeps the content filling level (L) at a constant level.

[0007] As shown in FIG. 5, a movement path of the web-like packaging material (W) from a sterilization tank (20) to the tube forming device (13), and a movement path of the tubular packaging material (T) from the tube forming device (13) to just before reaching the container forming device (16) are in an aseptic chamber (21). Aseptic air is supplied to the aseptic chamber (21) by a blower and an air supply tube (not shown), whereby an inside of the aseptic chamber (21) is maintained at a positive pressure. The air supply tube is usually provided at multiple locations, for example, the air supply tube may be also provided at an outer periphery of the filling tube (14) so as to supply the aseptic air toward an inside of the tubular packaging material (T). Therefore, an area above the content filling level (L) in the tubular packaging material (T) is also constantly supplied with the aseptic air and is maintained at a positive pressure.

[0008] In the filling and packaging machine (10), when a pressure applied by each pair of sealing jaws (161) and the forming flaps (162) acts on the tubular packaging material (T) filled with the content in the case of forming the pillow-shaped content filling container (C1) in the intermediate form, a lower end side of the tubular packaging material (T) is closed by the horizontally sealed portion, and thus a part of the content tends to move upward. However, when the content moves upward, an internal pressure of the tubular packaging material (T) is insufficient and pre-forming by the forming flaps (162) may be failed, or the filling amount of the content may be insufficient.

[0009] Therefore, a pressure flange (18) is attached around a portion of the filling tube (14) located below the content filling level (L). The pressure flange (18) receives the content that tends to move upward, in other words, a fluid pressure of the content, and secures the internal pressure required for forming the container (C1).

[0010] However, when the internal pressure is too high, the tubular packaging material (T) may be torn at a location of a vertically sealed portion, and thus an annular passage (22) is formed between an outer peripheral surface of the pressure flange (18) and an inner peripheral surface of the tubular packaging material (T) to relieve a part of the fluid pressure of the content upward (see FIG. 6).

[0011] Even in a filling and packaging machine in which the pre-forming is not performed by the forming flaps (162), it is also necessary to regulate the pressure using the pressure flange (18) in order to prevent splashes from a liquid surface due to a pressure by horizontal sealing from reaching the vertically sealed portion and to prevent a vertical sealing failure.

[0012] Here, the web-like packaging material (W) to be used as a container material has a connection portion (W10). For example, in the case of replacing rollers of the web-like packaging material (W), it is necessary to

overlap and bond an end portion (W11) of the old web-like packaging material (W) in use with a starting end portion (W12) of a new web-like packaging material (W) to be used, whereby a two-ply connection portion (W10) is formed (see (a) and (b) of FIG. 7). Such a connection portion (W10) may be formed in the case of replacing the rollers of the web-like packaging material (W), or may be formed in advance in a middle part of a length of the web-like packaging material (W) constituting one roller.

[0013] As shown in FIG. 7, the end portion (W11) of the old web-like packaging material (W) and the starting end portion (W12) of the new web-like packaging material (W) are usually cut so as to incline in the same direction with respect to respective length directions thereof. As shown in (c) of FIG. 7, the reason is that when a part including the connection portion (W10) of the web-like packaging material (W) is made into the tubular packaging material (T), in an overlapping portion (T1) formed by overlapping and vertically sealing both edges of the tubular packaging material (T) to each other, a four-ply portion is prevented from forming. A sealing tape (S) is attached to an inner surface of the tubular packaging material (T) so as to cover a step inside the overlapping portion (T1).

[0014] FIG. 8 shows a detailed structure of the portion of the tubular packaging material (T) which includes the connection portion (W10). Parts indicated by symbols (G1), (G2), (G3), and (G4) in (b) and (c) of FIG. 8 (parts defined by two-dot chain lines and broken lines in (a) of FIG. 8) are filled with a resin melted during vertical sealing, but there is a possibility that very rarely, the sealing is incomplete, and at any one of the parts (G1), (G2), (G3), and (G4), a gap is formed to conduct the inside and outside of the tubular packaging material (T).

[0015] Further, since an end surface of one of the web-like packaging materials (W) constituting the connection portion (W10) is exposed on the inner surface of the tubular packaging material (T) (see FIG. 8), and the content permeates this end surface, a container including the connection portion (W10) cannot be a product.

[0016] Therefore, the container including the connection portion (W10) of the web-like packaging material (W) and several containers before and after this container are discarded for safety.

Citation list

Patent Literature

[0017]

PTL 1: JP-A-2015-174665

PTL 2: JP-A-2017-226445

Summary of Invention

Technical Problem

[0018] In the filling and packaging machine (10), it has been found that a speed at which the content flows through the annular passage (22) into an area below the pressure flange (18) in the tubular packaging material (T) cannot keep up with a speed at which the tubular packaging material (T) is pulled down while being sandwiched by the two pairs of sealing jaws (161), and a negative pressure may be generated near the same area.

[0019] At the timing when the negative pressure is generated near the above area of the tubular packaging material (T), as described above, if an incompletely vertically sealed portion, which may occur very rarely in the part including the connection portion (W10) of the tubular packaging material (T), passes through a negative pressure generation portion, it is considered that a possibility that bacteria are mixed into the content in the tubular packaging material through the incompletely vertically sealed portion is not zero.

[0020] Assuming that bacteria are mixed into the content, since the content mixed with the bacteria may be pushed upward above the pressure flange (18) by a pressure applied by the forming flaps (162) and may be agitated, it is considered that even when the container including the connection portion and the containers before and after this container are discarded, there is still a possibility that the bacteria in the tubular packaging material (T) cannot be completely eliminated.

[0021] The invention has been made in view of the above problems, and an object of the invention is to provide a filling and packaging method and a filling and packaging machine that can reliably eliminate a risk of inclusion of bacteria in a content filled in a tubular packaging material even when a vertical sealing failure occurs in a connection portion of a web-like packaging material.

40 Solution to Problem

[0022] In order to achieve the above object, the invention includes the following aspects.

45 1) A filling and packaging method including:

forming a tubular packaging material by overlapping and vertically sealing both edges of a web-like packaging material to each other;
filling the tubular packaging material with a content by supplying the content through a filling tube inserted from above the tubular packaging material;
forming a content filling container by sandwiching the tubular packaging material filled with the content using a pair of sealing jaws and pulling the tubular packaging material down below a pressure flange provided around the filling tube

such that an annular passage is formed between the pressure flange and an inner surface of the tubular packaging material, and by horizontally sealing the tubular packaging material in a length corresponding to one container and cutting a horizontally sealed portion in the middle of a width of the horizontally sealed portion; detecting whether a connection portion of the web-like packaging material has passed through a predetermined position in a movement path of the web-like packaging material; reducing a supply amount of the content into the tubular packaging material based on detected passage information of the connection portion, to reduce a content filling level in the tubular packaging material from a normal position above the pressure flange to a negative pressure occurrence avoidance position below the pressure flange before the connection portion reaches an expected negative pressure occurrence area where a negative pressure is likely to occur along with pulling-down of the tubular packaging material by the pair of sealing jaws; and returning the content filling level from the negative pressure occurrence avoidance position to the normal position after the connection portion passes through the expected negative pressure occurrence area.

2) A filling and packaging method including:

forming a tubular packaging material by overlapping and vertically sealing both edges of a web-like packaging material to each other; filling the tubular packaging material with a content by supplying the content through a filling tube inserted from above the tubular packaging material; forming a content filling container by sandwiching the tubular packaging material filled with the content using a pair of sealing jaws and pulling the tubular packaging material down below a pressure flange provided around the filling tube such that an annular passage is formed between the pressure flange and an inner surface of the tubular packaging material, and by horizontally sealing the tubular packaging material in a length corresponding to one container and cutting a horizontally sealed portion in the middle of a width of the horizontally sealed portion; detecting whether a connection portion of the web-like packaging material has passed through a predetermined position in a movement path of the web-like packaging material; stopping supply of the content into the tubular packaging material based on detected passage information of the connection portion, to prevent

the content from remaining in the tubular packaging material before the connection portion reaches an expected negative pressure occurrence area where a negative pressure is likely to occur along with pulling-down of the tubular packaging material by the pair of sealing jaws; and

resuming the supply of the content into the tubular packaging material after the connection portion passes through the expected negative pressure occurrence area, to return a content filling level in the tubular packaging material to a normal position above the pressure flange.

3) In the filling and packaging method according to the above 1) or 2), the expected negative pressure occurrence area is an area between a position in the tubular packaging material corresponding to an upper surface of the pressure flange and a position of a first pair of sealing jaws at a time when a next pair of sealing jaws arrives above the first pair of sealing jaws, which has descended with the tubular packaging material sandwiched therebetween, and starts to clamp the tubular packaging material.

4) A filling and packaging machine including:

a tube forming device configured to form a tubular packaging material by overlapping and vertically sealing both edges of a web-like packaging material to each other;

a content filling device that includes a filling tube inserted from above into the tubular packaging material, and a regulating valve configured to regulate a supply amount of a content to be supplied into the tubular packaging material through the filling tube;

a pressure flange provided around the filling tube such that an annular passage is formed between the pressure flange and an inner surface of the tubular packaging material;

a container forming device configured to form a content filling container by sandwiching the tubular packaging material filled with the content using a pair of sealing jaws and pulling the tubular packaging material down below the pressure flange, and by horizontally sealing the tubular packaging material in a length corresponding to one container and cutting a horizontally sealed portion in the middle of a width of the horizontally sealed portion;

a detection unit configured to detect whether a connection portion of the web-like packaging material has passed through a predetermined position in a movement path of the web-like packaging material; and

a control unit configured to regulate the supply amount of the content into the tubular packaging material by controlling the regulating valve of the

content filling device based on passage information of the connection portion detected by the detection unit, in which

the control unit controls the regulating valve to reduce the supply amount of the content into the tubular packaging material based on the passage information of the connection portion detected by the detection unit, to reduce a content filling level in the tubular packaging material from a normal position above the pressure flange to a negative pressure occurrence avoidance position below the pressure flange before the connection portion reaches an expected negative pressure occurrence area where a negative pressure is likely to occur along with pulling-down of the tubular packaging material by the pair of sealing jaws, and to return the content filling level from the negative pressure occurrence avoidance position to the normal position after the connection portion passes through the expected negative pressure occurrence area.

5) A filling and packaging machine including:

a tube forming device configured to form a tubular packaging material by overlapping and vertically sealing both edges of a web-like packaging material to each other;

a content filling device that includes a filling tube inserted from above into the tubular packaging material, and a regulating valve configured to regulate a supply amount of a content to be supplied into the tubular packaging material through the filling tube;

a pressure flange provided around the filling tube such that an annular passage is formed between the pressure flange and an inner surface of the tubular packaging material;

a container forming device configured to form a content filling container by sandwiching the tubular packaging material filled with the content using a pair of sealing jaws and pulling the tubular packaging material down below the pressure flange, and by horizontally sealing the tubular packaging material in a length corresponding to one container and cutting a horizontally sealed portion in the middle of a width of the horizontally sealed portion;

a detection unit configured to detect whether a connection portion of the web-like packaging material has passed through a predetermined position in a movement path of the web-like packaging material; and

a control unit configured to regulate the supply amount of the content into the tubular packaging material by controlling the regulating valve of the content filling device based on passage information of the connection portion detected by the

detection unit, in which

the control unit controls the regulating valve to stop supply of the content into the tubular packaging material based on the passage information of the connection portion detected by the detection unit, to prevent the content from remaining in the tubular packaging material before the connection portion reaches an expected negative pressure occurrence area where a negative pressure is likely to occur along with pulling-down of the tubular packaging material by the pair of sealing jaws, and to resume the supply of the content into the tubular packaging material so as to return the content filling level in the tubular packaging material to a normal position above the pressure flange after the connection portion passes through the expected negative pressure occurrence area.

6) In the filling and packaging machine according to the above 4) or 5), the expected negative pressure occurrence area is an area between a position in the tubular packaging material corresponding to an upper surface of the pressure flange and a position of a first pair of sealing jaws at a time when a next pair of sealing jaws arrives above the first pair of sealing jaws, which has descended with the tubular packaging material sandwiched therebetween, and starts to clamp the tubular packaging material.

Advantageous Effect

[0023] According to the filling and packaging method of the above 1) or the filling and packaging machine of the above 4), since the content filling level in the tubular packaging material is reduced to the negative pressure occurrence avoidance position below the pressure flange when the connection portion of the web-like packaging material passes through the expected negative pressure occurrence area, no negative pressure occurs inside the tubular packaging material. Therefore, a possibility that bacteria from the outside are mixed into the content filled in the tubular packaging material can be reliably eliminated even when a vertical sealing failure occurs in the connection portion of the web-like packaging material.

[0024] According to the filling and packaging method of the above 2) or the filling and packaging machine of the above 5), since it is in a state where the content does not remain in the tubular packaging material when the connection portion of the web-like packaging material passes through the expected negative pressure occurrence area, no negative pressure occurs inside the tubular packaging material. Therefore, the possibility that the bacteria from the outside are mixed into the content filled in the tubular packaging material can be further reliably eliminated even when the vertical sealing failure occurs in the connection portion of the web-like packaging material.

[0025] According to the filling and packaging method of the above 3) or the filling and packaging machine of the above 6), since the expected negative pressure occurrence area is set to the area between the position in the tubular packaging material corresponding to the upper surface of the pressure flange and the position of a first pair of sealing jaws at a time when a next pair of sealing jaws arrives above the first pair of sealing jaws, which has descended with the tubular packaging material sandwiched therebetween, and starts to clamp the tubular packaging material, the supply amount of the content required to achieve the above effects can be easily regulated.

[0026] According to the filling and packaging method of the above 1) to 3) or the filling and packaging machine of the above 4) to 6), when a container including the connection portion and containers before and after this container are discarded, wasteful disposal of the content can be reduced since the amount of the content filled into these containers is reduced.

Brief Description of Drawings

[0027]

[FIG. 1] FIG. 1 is a front view showing main portions of a filling and packaging machine according to an embodiment of the invention.

[FIG. 2] FIG. 2 is a front view sequentially showing parts of a container forming process using two pairs of sealing jaws of the filling and packaging machine.

[FIG. 3] FIG. 3 is a front view showing a first aspect of a filling and packaging method using the filling and packaging machine in order of processes.

[FIG. 4] FIG. 4 is a front view showing a second aspect of the filling and packaging method using the filling and packaging machine in order of processes.

[FIG. 5] FIG. 5 is a perspective view showing an overall outline of a filling and packaging machine in the related art.

[FIG. 6] FIG. 6 is a front view showing a part of a content filling device and a container forming device in the filling and packaging machine.

[FIG. 7] (a) and (b) are front views sequentially showing a process of forming a connection portion of a web-like packaging material during roller replacement, and (c) is a cutaway perspective view of a part including a connection portion of a tubular packaging material.

[FIG. 8] FIG. 8 shows details of the part including the connection portion of the tubular packaging material, in which (a) is a vertical cross-sectional view seen from an inner side of the tubular packaging material, (b) is a cross-sectional view taken along a line b-b in (a), and (c) is a cross-sectional view taken along a line c-c in (a).

Description of Embodiments

[0028] Hereinafter, embodiments of the invention will be described with reference to the drawings.

[0029] FIG. 1 shows main portions of a filling and packaging machine according to an embodiment of the invention. FIG. 2 sequentially shows parts of a container forming process using two pairs of sealing jaws of the filling and packaging machine. FIG. 3 and FIG. 4 show two aspects of a filling and packaging method using the filling and packaging machine.

[0030] Since a structure of the filling and packaging machine according to this embodiment is substantially the same as that in the related art described above with reference to FIGS. 5 to 8, except for points to be described later, the repeated description will be omitted.

[0031] As shown in FIG. 1, a filling and packaging machine (10) according to the embodiment further includes a detection unit (23) configured to detect whether a connection portion (W10) of a web-like packaging material (W) has passed through a predetermined position in a movement path of the web-like packaging material (W), and a control unit (24) configured to regulate a supply amount of a content into a tubular packaging material (T) by controlling a regulating valve (151) of a content filling device (15) based on passage information of the connection portion (W10) detected by the detection unit (23).

[0032] In addition, as shown in FIG. 1, around a filling tube (14), an air supply tube (25) for supplying aseptic air into the tubular packaging material (T) is concentrically provided. An area in the tubular packaging material (T) above a content filling level (L) is maintained at a positive pressure by being continuously supplied with the aseptic air through the air supply tube (25).

[0033] Further, in FIG. 1, a level detection unit (26) is provided on a side of the tubular packaging material (T) to follow a vertical moving range of a float (19). The level detection unit (26) is implemented as, for example, a magnetic sensor that detects a magnet (not shown) arranged at a predetermined level in the float (19), and can detect the filling level (L) of the content filled in the tubular packaging material (T).

[0034] As shown in FIG. 1, the detection unit (23) includes a lever (232) that is arranged above and close to a predetermined dancer roller (121) of a rewinding device (12) and has a length intermediate portion swingably supported by a horizontal support shaft (231), a contact roller (233) that is rotatably attached to one end portion of the lever (232) and is contactable from above with the web-like packaging material (W) moving along the dancer roller (121), and a displacement detection switch (234) that is upwardly arranged below the other end portion of the lever (232).

[0035] When the contact roller (233) comes into contact with the connection portion (W10) of the web-like packaging material (W), the contact roller (233) is pushed up by a thickness of the web-like packaging material (W), and the other end portion of the lever (232) that swings

accordingly pushes down the displacement detection switch (234), whereby the detection unit (23) can detect that the connection portion (W10) has passed. When the passage of the connection portion (W10) is detected, the passage information is transmitted from the displacement detection switch (234) to the control unit (24).

[0036] The configuration and arrangement of the detection unit are not limited to the above aspect and can be changed as appropriate.

[0037] The control unit (24) is implemented as, for example, a programmable logic controller (PLC) equipped with a CPU or the like, and has a function of regulating the content filling level (L) in the tubular packaging material (T) within a certain range by which controlling the regulating valve (151) of the content filling device (15) based on a level signal transmitted from the level detection unit (26) and regulating the supply amount of the content supplied through the filling tube (14).

[0038] In addition, as described above, the control unit (24) according to this embodiment also has a function of regulating the supply amount of the content into the tubular packaging material (T) by controlling the regulating valve (151) of the content filling device (15) based on the passage information of the connection portion (W10) of the web-like packaging material (W) detected by the detection unit (23). Here, the regulating valve (151) is implemented as, for example, an electric valve such as an electric butterfly valve and a diaphragm type electric valve, or an electromagnetic valve such as a solenoid valve.

[0039] Next, a process of forming a pillow-shaped content filling container (C1) as an intermediate form by two pairs of sealing jaws (161) of a container forming device (16) will be described, and a change in internal pressure of the tubular packaging material (T) in each process will be described with reference to FIG. 2.

[0040] First, as shown in (a) of FIG. 2, at a position below a tip of the filling tube (14), a first pair of sealing jaws (161) sandwiches and horizontally seals the tubular packaging material (T), and starts to descend in this state. Accordingly, the tubular packaging material (T) is pulled down, so that the internal pressure of the tubular packaging material (T) decreases, and a negative pressure may occur. On the other hand, a next pair of sealing jaws (161) rises in an open state on outer sides of the first pair of sealing jaws (161) while the first pair of sealing jaws (161) descends.

[0041] Forming flaps (162) of the first pair of sealing jaws (161) remain open at the time of horizontally sealing the tubular packaging material (T), and are then closed while both the sealing jaws (161) descend and the tubular packaging material (T) is pulled down, whereby the tubular packaging material (T) is formed (see (a) of FIG. 2). At this time, the internal pressure of the tubular packaging material (T) may increase momentarily to become a positive pressure, but it is considered that the internal pressure may decrease again as the first pair of sealing jaws (161) continues to descend.

[0042] Then, as shown in (b) of FIG. 2, when the first pair of sealing jaws (161) almost stops descending, the internal pressure of the tubular packaging material (T) to which the content is continuously supplied begins to rise.

[0043] Next, as shown in (c) of FIG. 2, the next pair of sealing jaws (161) arrives above the first pair of sealing jaws (161), and the next pair of sealing jaws (161) closes so as to start to clamp the tubular packaging material (T). At this time, that is, when the next pair of sealing jaws (161) begins to press and crush the tubular packaging material (T) from both sides thereof, since the internal pressure of the tubular packaging material (T) rises sharply, the pressure inside the tubular packaging material (T) is surely positive.

[0044] Then, the two pairs of sealing jaws (161) both start to descend in a closed state, but the first pair of sealing jaws (161) is separated from the tubular packaging material (T) by opening outward during the descending and rises again for a next process.

[0045] By repeating the above processes, the pillow-shaped content filling container (C1) is continuously formed, and the internal pressure of the tubular packaging material (T) is repeatedly increased and decreased accordingly.

[0046] Therefore, as shown in (c) of FIG. 2, an expected negative pressure occurrence area (A) where a negative pressure is likely to occur along with the pulling-down of the tubular packaging material (T) by the two pairs of sealing jaws (161) of the container forming device (16) can be defined as an area between a position in the tubular packaging material (T) corresponding to an upper surface of a pressure flange (18) and a position of the first pair of sealing jaws (161) at a time when the next pair of sealing jaws (161) arrives above the first pair of sealing jaws (161), which descends with the tubular packaging material sandwiched therebetween, and starts to clamp the tubular packaging material (T).

[0047] However, a range, upper and lower limit positions of the expected negative pressure occurrence area (A) may change depending on factors such as a viscosity of the content, a size of an annular passage (22) between the pressure flange (18) and the tubular packaging material (T), and a pulling-down speed of the tubular packaging material (T) by the sealing jaws (161).

[0048] FIG. 3 shows a first aspect of a filling and packaging method using the filling and packaging machine (10) including the detection unit (23) and the control unit (24).

[0049] First, as shown in (a) of FIG. 3, in a normal state where the container (C1) is formed by the container forming device (16) using the tubular packaging material (T) that does not include the connection portion (W10) of the web-like packaging material (W), the control unit (24) controls the regulating valve (151) based on the level signal from the level detection unit (26) to regulate the supply amount of the content such that the content filling level is at a normal position (L1) above the pressure flange (18).

[0050] Next, when the detection unit (23) detects the passage of the connection portion (W10) of the web-like packaging material (W), a detection signal is immediately transmitted to the control unit (24). The control unit (24) calculates a timing at which the tubular packaging material (T) including the connection portion (W10) reaches the container forming device (16), transmits a control signal to the regulating valve (151) based on the timing, and regulates the supply amount of the content. Specifically, the supply amount of the content is reduced such that the content filling level in the tubular packaging material (T) is reduced from the normal position (L1) above the pressure flange (18) to a negative pressure occurrence avoidance position (L2) below the pressure flange (18) before the connection portion (W10) reaches the expected negative pressure occurrence area (A) where a negative pressure is likely to occur along with the pulling-down of the tubular packaging material (T) by the pair of sealing jaws (161) of the container forming device (16) (see (b) of FIG. 3).

[0051] Then, the control unit (24) controls the regulating valve (151) such that the content filling level returns from a negative pressure occurrence avoidance position (L3) to the normal position (L1) after the connection portion (W10) passes through the expected negative pressure occurrence area (A) (see (c) of FIG. 3). Specifically, the regulating valve (151) is controlled such that after the connection portion (W10) enters the expected negative pressure occurrence area (A), the supply amount of the content into the tubular packaging material (T) is increased at a predetermined timing. The timing for increasing the supply amount of the content is usually set to a timing after the connection portion (W10) passes through the expected negative pressure occurrence area (A), but the timing may also be a timing earlier than this timing.

[0052] With the filling and packaging method according to the first aspect, the following effects are achieved.

[0053] That is, since the content filling level in the tubular packaging material (T) is reduced to the negative pressure occurrence avoidance positions (L2) and (L3) below the pressure flange (18) while the connection portion (W10) of the web-like packaging material (W) passes through the expected negative pressure occurrence area (A), the area above the content filling levels (L2) (L3) in the tubular packaging material (T) is filled with the aseptic air supplied through the air supply tube (25). In this state, there is no liquid content that obstructs distribution in the annular passage (22) between the pressure flange (18) and the tubular packaging material (T), and thus no negative pressure occurs inside the tubular packaging material (T) even when the tubular packaging material (T) is pulled down by the sealing jaws (161). Therefore, even when a vertical sealing failure occurs in the connection portion (W10) of the web-like packaging material (W), a possibility that bacteria from the outside are mixed into the content filled in the tubular packaging material (T) can be reliably eliminated.

[0054] In addition, according to the filling and packaging method of the above aspect, when the container (C1) including the connection portion (10) and containers (C1) before and after this container (C1) are discarded, wasteful disposal of the content can be reduced since the amount of the content filled into these containers (C1) is reduced.

[0055] FIG. 4 shows a second aspect of the filling and packaging method using the filling and packaging machine (10) including the detection unit (23) and the control unit (24).

[0056] First, as shown in (a) of FIG. 4, in a normal state where the container (C1) is formed by the container forming device (16) using the tubular packaging material (T) that does not include the connection portion (W10) of the web-like packaging material (W), it is the same as the case of the first aspect shown in (a) of FIG. 3.

[0057] Next, when the detection unit (23) detects the passage of the connection portion (W10) of the web-like packaging material (W), a detection signal is immediately transmitted to the control unit (24). The control unit (24) calculates a timing at which the tubular packaging material (T) including the connection portion (W10) reaches the container forming device (16), transmits a control signal to the regulating valve (151) based on the timing, and stops the supply of the content. Accordingly, the content is prevented from remaining in the tubular packaging material (T) before the connection portion (W10) reaches the expected negative pressure occurrence area (A) (see (b) of FIG. 4).

[0058] Then, by transmitting the control signal from the control unit (24) to the regulating valve (151) and resuming the supply of the content into the tubular packaging material (T) after the connection portion (W10) passes through the expected negative pressure occurrence area (A) (see (c) of FIG. 4), the content filling level returns to the normal position (L1).

[0059] According to the filling and packaging method of the second aspect, since it is in a state where the content does not remain in the tubular packaging material (T) while the connection portion (W10) of the web-like packaging material (W) passes through the expected negative pressure occurrence area (A), no negative pressure occurs inside the tubular packaging material (T). Therefore, according to the above method, the possibility that the bacteria from the outside are mixed into the content filled in the tubular packaging material (T) can be further reliably eliminated even when the vertical sealing failure occurs in the connection portion (W10) of the web-like packaging material (W).

[0060] As in the two aspects, the filling and packaging method and the filling and packaging machine according to the invention can be applied to not only a case where the container forming device (16) is a device that moves the two pairs of sealing jaws (161) up and down alternately, but also a case where the container forming device is a caterpillar type device in which three or more pairs (for example, four pairs) of sealing jaws are sequen-

tially moved along a vertical circulation path.

Industrial Application

[0061] The invention is preferably used as a filling and packaging method and a filling and packaging machine that fill and package a content such as a fluid food and a beverage in a container formed of a web-like packaging material mainly including paper or the like.

Reference Sign List

[0062]

- (10): filling and packaging machine 15
- (13): tube forming device
- (14): filling tube
- (15): content filling device
- (151): regulating valve
- (18): pressure flange 20
- (16): container forming device
- (161): sealing jaw
- (22): annular passage
- (23): detection unit
- (24): control unit 25
- (W): web-like packaging material
- (W10): connection portion
- (T): tubular packaging material
- (L1): content filling level (normal position)
- (L2), (L3): content filling level (negative pressure occurrence avoidance position) 30
- (A): expected negative pressure occurrence area

Claims

1. A filling and packaging method comprising:

forming a tubular packaging material by overlapping and vertically sealing both edges of a web-like packaging material to each other; 40

filling the tubular packaging material with a content by supplying the content through a filling tube inserted from above the tubular packaging material; 45

forming a content filling container by sandwiching the tubular packaging material filled with the content using a pair of sealing jaws and pulling the tubular packaging material down below a pressure flange provided around the filling tube 50

such that an annular passage is formed between the pressure flange and an inner surface of the tubular packaging material, and by horizontally sealing the tubular packaging material in a length corresponding to one container and cutting a horizontally sealed portion in the middle of a width of the horizontally sealed portion; 55

detecting whether a connection portion of the

web-like packaging material has passed through a predetermined position in a movement path of the web-like packaging material; reducing a supply amount of the content into the tubular packaging material based on detected passage information of the connection portion, to reduce a content filling level in the tubular packaging material from a normal position above the pressure flange to a negative pressure occurrence avoidance position below the pressure flange before the connection portion reaches an expected negative pressure occurrence area where a negative pressure is likely to occur along with pulling-down of the tubular packaging material by the pair of sealing jaws; and returning the content filling level from the negative pressure occurrence avoidance position to the normal position after the connection portion passes through the expected negative pressure occurrence area.

2. A filling and packaging method comprising:

forming a tubular packaging material by overlapping and vertically sealing both edges of a web-like packaging material to each other; filling the tubular packaging material with a content by supplying the content through a filling tube inserted from above the tubular packaging material;

forming a content filling container by sandwiching the tubular packaging material filled with the content using a pair of sealing jaws and pulling the tubular packaging material down below a pressure flange provided around the filling tube such that an annular passage is formed between the pressure flange and an inner surface of the tubular packaging material, and by horizontally sealing the tubular packaging material in a length corresponding to one container and cutting a horizontally sealed portion in the middle of a width of the horizontally sealed portion;

detecting whether a connection portion of the web-like packaging material has passed through a predetermined position in a movement path of the web-like packaging material; stopping supply of the content into the tubular packaging material based on detected passage information of the connection portion, to prevent the content from remaining in the tubular packaging material before the connection portion reaches an expected negative pressure occurrence area where a negative pressure is likely to occur along with pulling-down of the tubular packaging material by the pair of sealing jaws; and resuming the supply of the content into the tu-

bular packaging material after the connection portion passes through the expected negative pressure occurrence area, to return a content filling level in the tubular packaging material to a normal position above the pressure flange.

3. The filling and packaging method according to claim 1 or 2, wherein

the expected negative pressure occurrence area is an area between a position in the tubular packaging material corresponding to an upper surface of the pressure flange and a position of a first pair of sealing jaws at a time when a next pair of sealing jaws arrives above the first pair of sealing jaws, which has descended with the tubular packaging material sandwiched therebetween, and starts to clamp the tubular packaging material.

4. A filling and packaging machine comprising:

a tube forming device configured to form a tubular packaging material by overlapping and vertically sealing both edges of a web-like packaging material to each other;

a content filling device that includes a filling tube inserted from above into the tubular packaging material, and a regulating valve configured to regulate a supply amount of a content to be supplied into the tubular packaging material through the filling tube;

a pressure flange provided around the filling tube such that an annular passage is formed between the pressure flange and an inner surface of the tubular packaging material;

a container forming device configured to form a content filling container by sandwiching the tubular packaging material filled with the content using a pair of sealing jaws and pulling the tubular packaging material down below the pressure flange, and by horizontally sealing the tubular packaging material in a length corresponding to one container and cutting a horizontally sealed portion in the middle of a width of the horizontally sealed portion;

a detection unit configured to detect whether a connection portion of the web-like packaging material has passed through a predetermined position in a movement path of the web-like packaging material; and

a control unit configured to regulate the supply amount of the content into the tubular packaging material by controlling the regulating valve of the content filling device based on passage information of the connection portion detected by the detection unit, wherein

the control unit controls the regulating valve to reduce the supply amount of the content into the tubular packaging material based on the pas-

sage information of the connection portion detected by the detection unit, to reduce a content filling level in the tubular packaging material from a normal position above the pressure flange to a negative pressure occurrence avoidance position below the pressure flange before the connection portion reaches an expected negative pressure occurrence area where a negative pressure is likely to occur along with pulling-down of the tubular packaging material by the pair of sealing jaws, and to return the content filling level from the negative pressure occurrence avoidance position to the normal position after the connection portion passes through the expected negative pressure occurrence area.

5. A filling and packaging machine comprising:

a tube forming device configured to form a tubular packaging material by overlapping and vertically sealing both edges of a web-like packaging material to each other;

a content filling device that includes a filling tube inserted from above into the tubular packaging material, and a regulating valve configured to regulate a supply amount of a content to be supplied into the tubular packaging material through the filling tube;

a pressure flange provided around the filling tube such that an annular passage is formed between the pressure flange and an inner surface of the tubular packaging material;

a container forming device configured to form a content filling container by sandwiching the tubular packaging material filled with the content using a pair of sealing jaws and pulling the tubular packaging material down below the pressure flange, and by horizontally sealing the tubular packaging material in a length corresponding to one container and cutting a horizontally sealed portion in the middle of a width of the horizontally sealed portion;

a detection unit configured to detect whether a connection portion of the web-like packaging material has passed through a predetermined position in a movement path of the web-like packaging material; and

a control unit configured to regulate the supply amount of the content into the tubular packaging material by controlling the regulating valve of the content filling device based on passage information of the connection portion detected by the detection unit, wherein

the control unit controls the regulating valve to stop supply of the content into the tubular packaging material based on the passage information of the connection portion detected by the detection unit, to prevent the content from re-

maintaining in the tubular packaging material before the connection portion reaches an expected negative pressure occurrence area where a negative pressure is likely to occur along with pulling-down of the tubular packaging material by the pair of sealing jaws, and to resume the supply of the content into the tubular packaging material so as to return a content filling level in the tubular packaging material to a normal position above the pressure flange after the connection portion passes through the expected negative pressure occurrence area.

6. The filling and packaging machine according to claim 4 or 5, wherein the expected negative pressure occurrence area is an area between a position in the tubular packaging material corresponding to an upper surface of the pressure flange and a position of a first pair of sealing jaws at a time when a next pair of sealing jaws arrives above the first pair of sealing jaws, which has descended with the tubular packaging material sandwiched therebetween, and starts to clamp the tubular packaging material.

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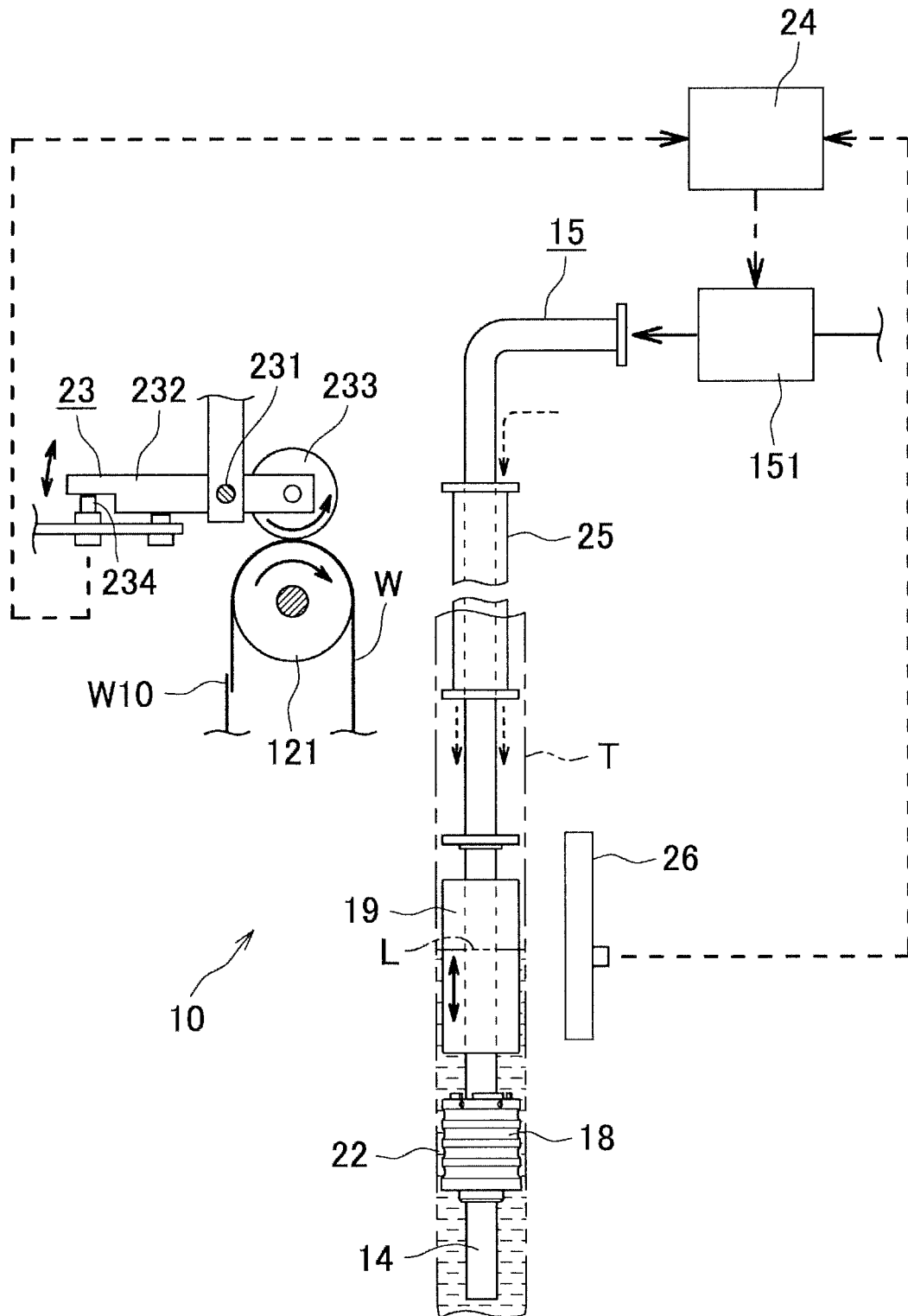


FIG. 1

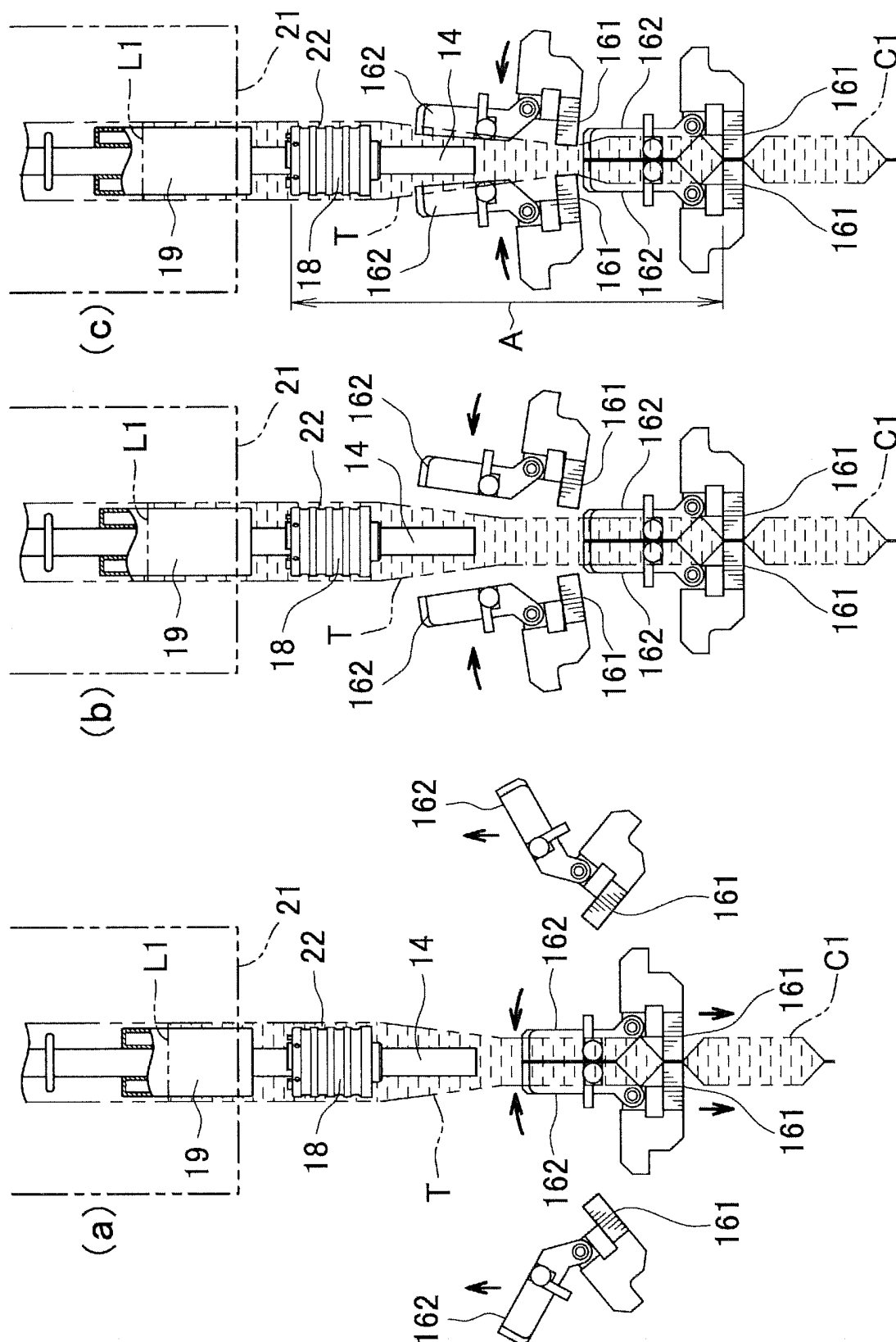


FIG. 2

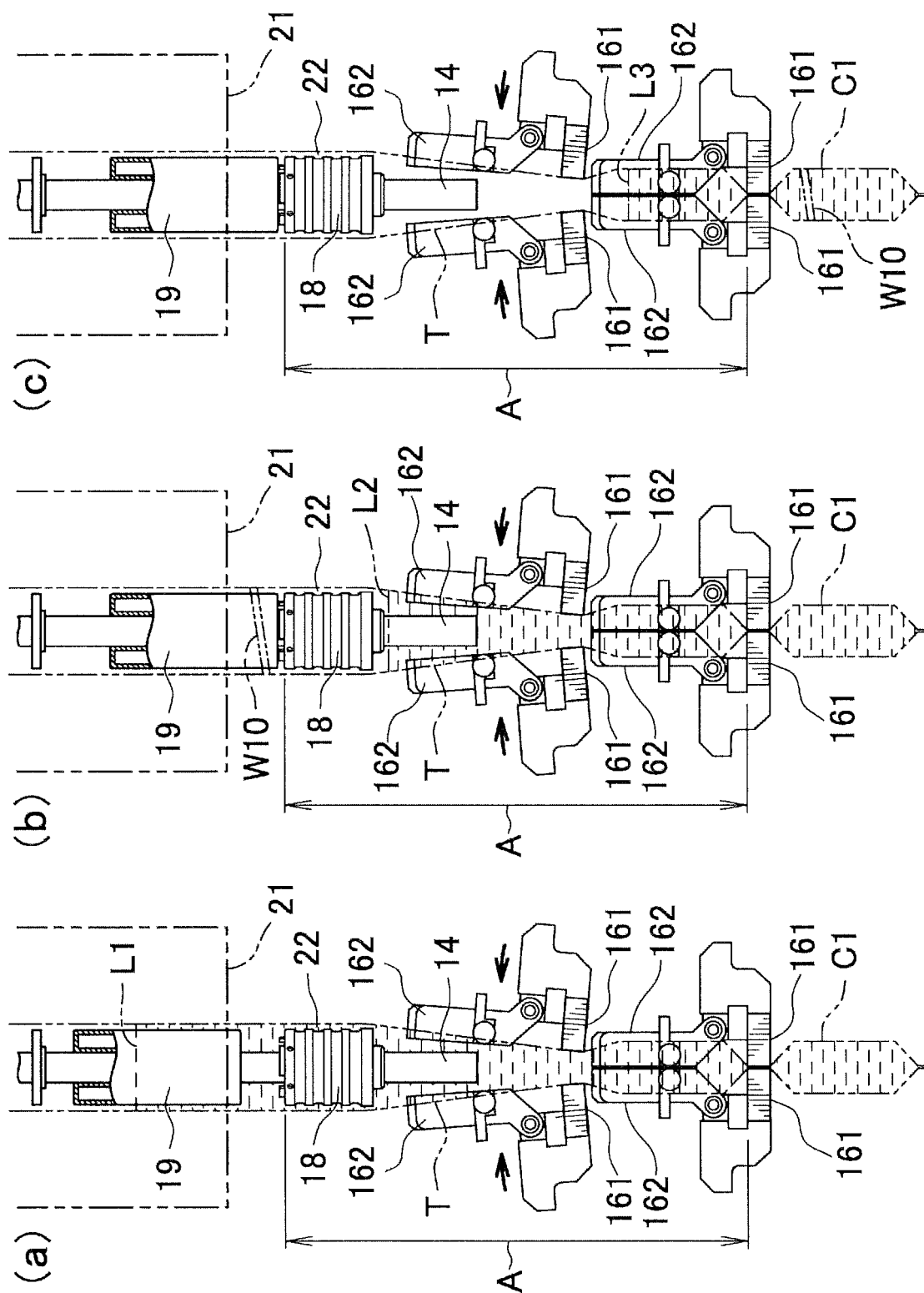


FIG. 3

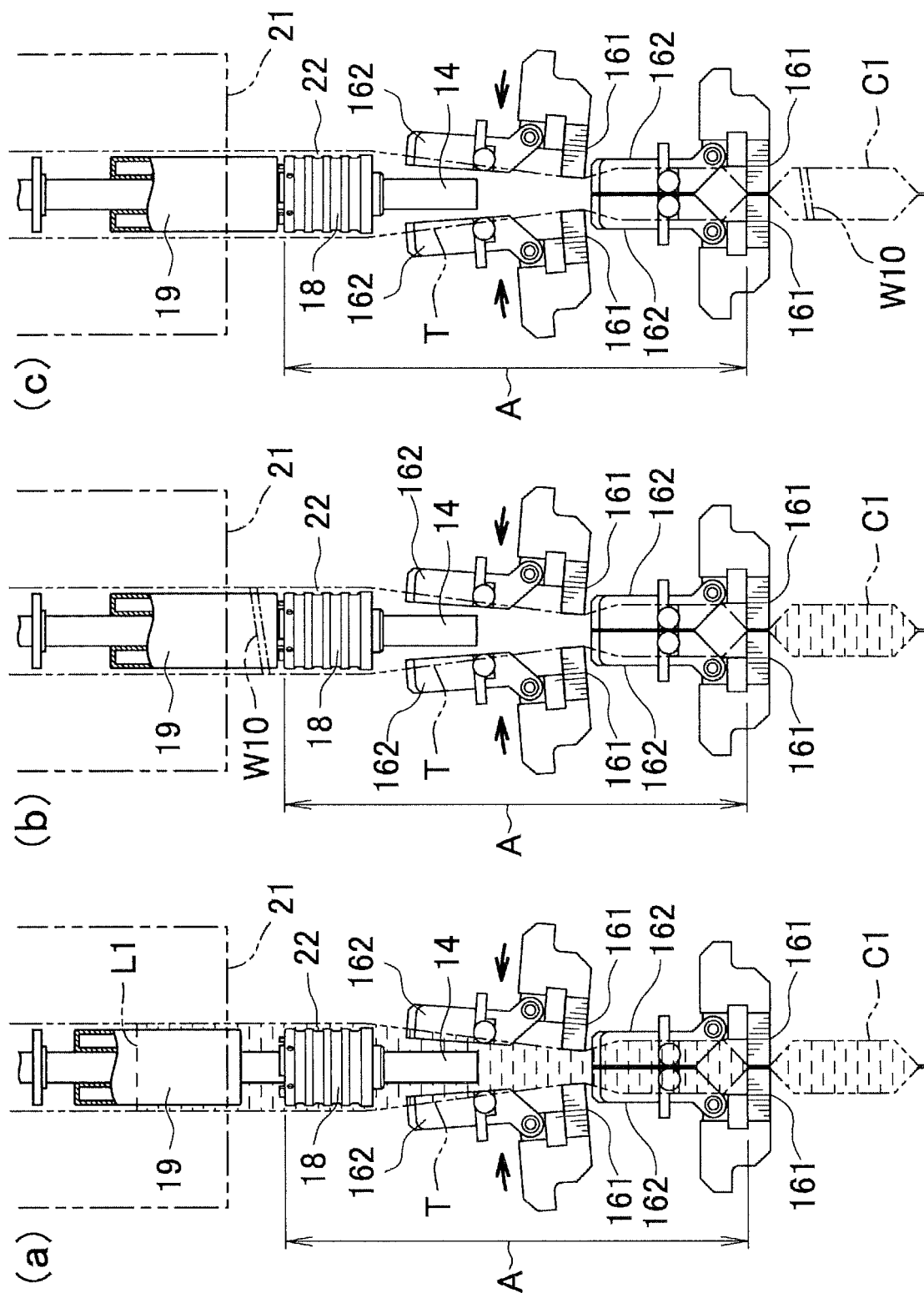


FIG. 4

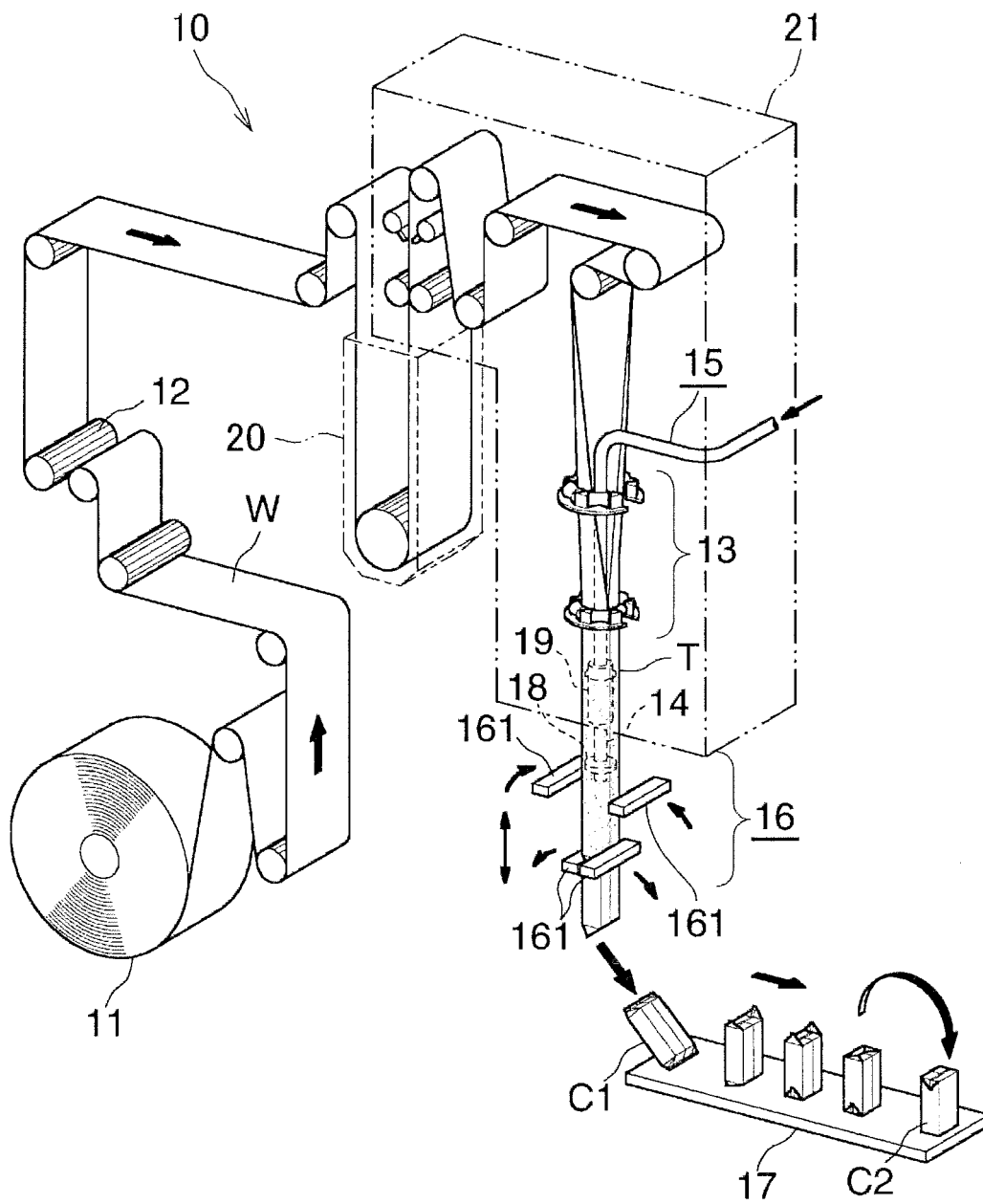


FIG. 5

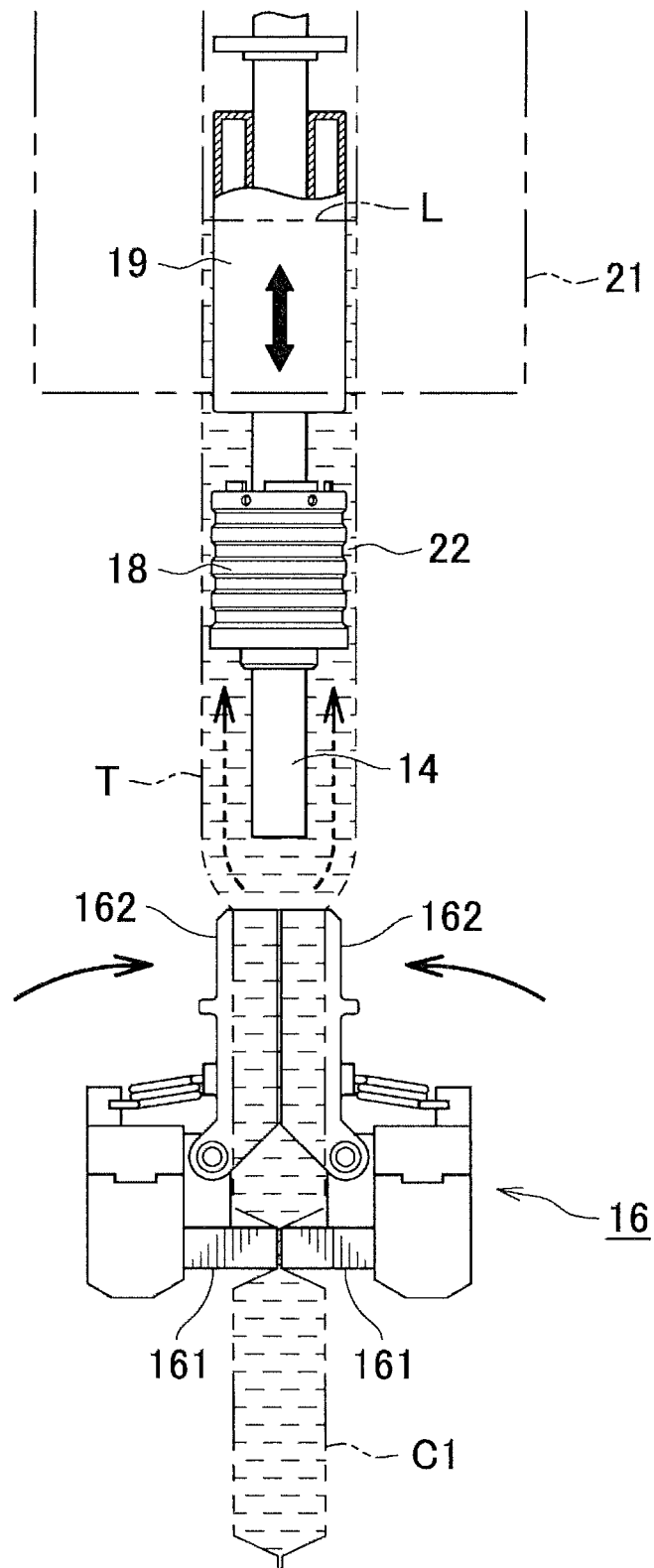


FIG. 6

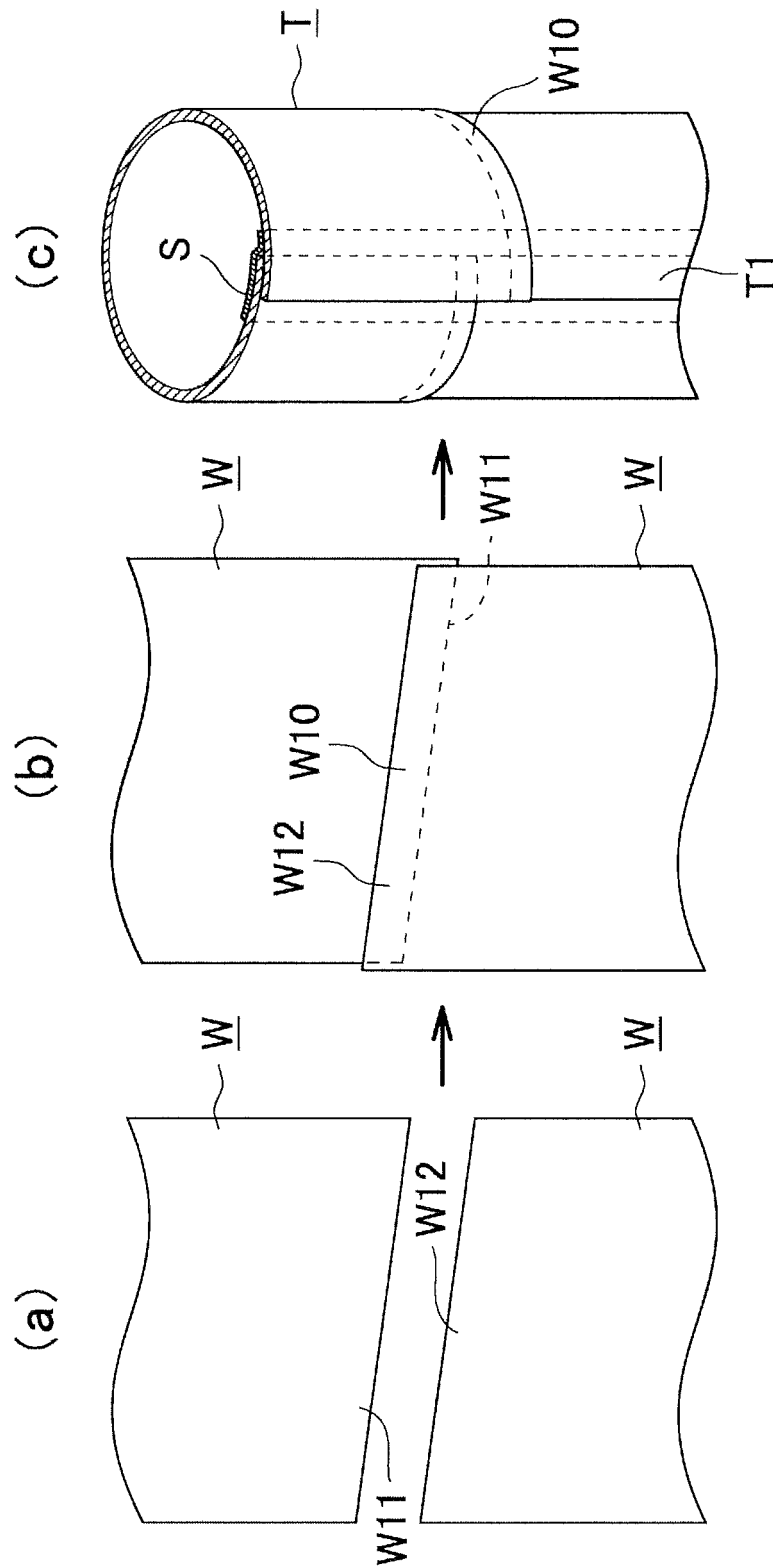


FIG. 7

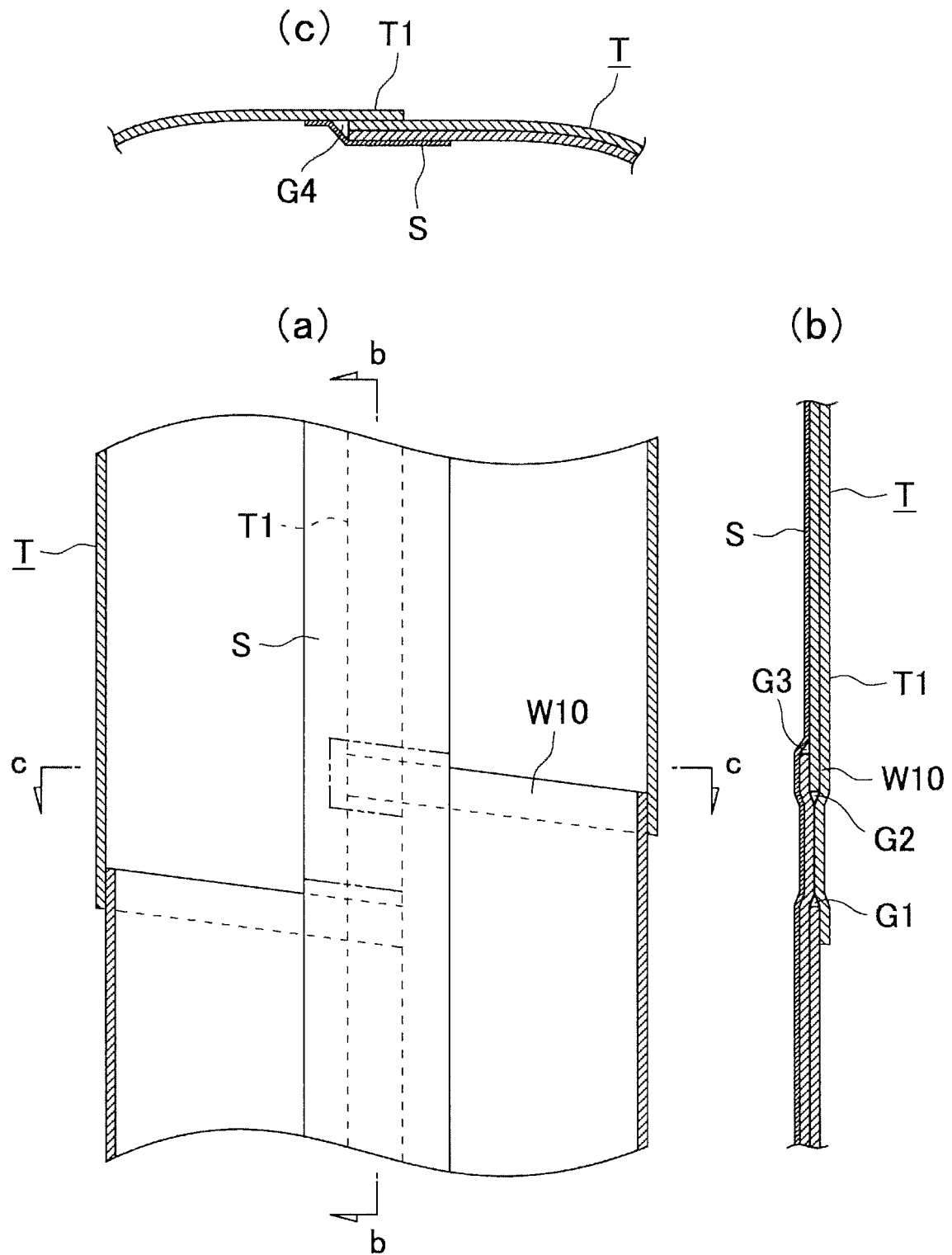


FIG. 8

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/046809

A. CLASSIFICATION OF SUBJECT MATTER

B65B 9/20 (2012.01) i; B65B 57/00 (2006.01) i; B65B 57/14 (2006.01) i
 FI: B65B9/20; B65B57/00 H; B65B57/14

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 B65B9/20; B65B57/00; B65B57/14

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2021
Registered utility model specifications of Japan	1996-2021
Published registered utility model applications of Japan	1994-2021

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2009/139129 A1 (TETRA LAVAL HOLDINGS & FINANCE S.A.) 19 November 2009 (2009-11-19)	1-6
A	WO 2009/150693 A1 (TETRA LAVAL HOLDINGS & FINANCE S.A.) 17 December 2009 (2009-12-17)	1-6
A	JP 2010-143627 A (NIHON TETRA PAK KK) 01 July 2010 (2010-07-01)	1-6

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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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Date of the actual completion of the international search
 18 February 2021 (18.02.2021)

Date of mailing of the international search report
 09 March 2021 (09.03.2021)

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Name and mailing address of the ISA/
 Japan Patent Office
 3-4-3, Kasumigaseki, Chiyoda-ku,
 Tokyo 100-8915, Japan

Authorized officer

Telephone No.

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INTERNATIONAL SEARCH REPORT
 Information on patent family members

International application No.

PCT/JP2020/046809

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WO 2009/150693 A1	17 Dec. 2009	US 2011/0154779 A1 EP 2284080 A1 CN 102056806 A	
JP 2010-143627 A	01 Jul. 2010	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- JP 2017226445 A [0017]