

DESCRIPTION

VERTICAL FILLING-PACKAGING MACHINE

5 **Technical Field**

The present invention relates to a vertical filling-packaging machine which forms a long film drawn from a feed roll into a tubular film and feeding content material thereinto, thereby manufacturing a packaging bag (packaged product), and more particularly to a vertical filling-packaging
10 machine which feeds the content material through an injection nozzle into the tubular film that includes a bottom portion.

Background Art

There has been known a packaging machine which continuously
15 manufactures a packaging bag filled with content material such as liquid (for example, see Japanese Patent Laid-Open No. 2005-112359). The packaging machine manufactures the packaging bag by folding a long sheet of film drawn from a feed roll to form a tubular shape and by injecting the content material into the tubular film or forming a predetermined seal portion.
20 Hereinafter, a typical packaging operation will be described with reference to Figure 1.

Figure 1A illustrates an initial state of the packaging operation, in which lateral seal portion F2 formed in the previous process is formed at the lower end portion of tubular film 1', thereby allowing tubular film 1' to have a
25 bottom portion. A pair of squeezing rollers 45 is used to squeezingly divide

the content material injected into the tubular film. Lateral seal 60 is used to tightly seal an upper opening portion of the tubular film.

Following the initial state of Figure 1A, as shown in Figure 1B, first, the pair of squeezing rollers 45 is driven so as to pinch tubular film 1 therebetween. Thus, the content material inside tubular film 1' is divided into upper and lower portions. Since squeezing rollers 45 squeezingly pinch the portion in which the content material is present, in this way, the amount of air mixed into the final packaging bag 91 can be minimized.

Then, as shown in Figure 1C, when squeezing rollers 45 are rotated, void-filled portion 2 in which no content material exists is formed on tubular film 1', which is transported downward. When void-filled portion 2 reaches a position where it is to be pinched by lateral sealing mechanism 60, lateral sealing mechanism 60 pinches void-filled portion 2.

Then, as shown in Figure 1D, lateral sealing mechanism 60 is moved downward in a state in which the tubular film is pinched, thereby forming lateral seal portion F2. During this process, the content material continues to be fed from injection nozzle 15 and the fed content material is accumulated in an upper area higher than squeezing rollers 45.

Then, as shown in Figure 1E, when lateral sealing mechanism 60 completes heat sealing and cutoff operations, one packaging bag 91 filled with content material is obtained. In the meantime, the pair of squeezing rollers 45 is opened, whereby the content material that has been accumulated in the area higher than squeezing rollers 45 are dropped downward. Subsequently, lateral sealing mechanism 60 is moved back to the original position to return to the initial state of Figure 1A.

As another technique related to the packaging machine of the present invention, there has been known a mechanism for, when one feed roll is used up, joining the end portion of a film of the feed roll to the start portion of a film of another feed roll to be used (see Japanese Patent Laid-Open No. H09-58616). The use of such a mechanism can eliminate the need of troublesome work such as setting a film again each time one feed roll has been used up.

However, such packaging operations as shown in Figures 1A to 1E have a problem in that when content material is fed from the injection nozzle into a tubular film, a variation occurs in the amount of fed content material or bubbles of air or the like are mixed into the content material for the reasons described below.

As shown in Figure 2, the packaging operation of Figure 1 is configured such that when squeezing rollers 45 are opened, the content material is dropped downward, and such that when the content material is dropped, lower end 15a of the injection nozzle is exposed. In the state as shown in Figure 2A, injection nozzle 15 is filled with the content material. However, as shown in Figure 2B, when the lower end of the nozzle is exposed and open to air, the content material remaining inside the nozzle is also dropped into the tubular film.

This means that the injection nozzle is emptied. When content material is fed through such an emptied nozzle, the content material gradually flows downward inside the emptied nozzle, so that it is difficult to feed the content material with good quantitative accuracy.

In addition, as shown in Figure 2B, when content material is fed in a

state in which lower end 15a of the nozzle is exposed, lower end 15a is positioned higher than the liquid level, and thus there is also a problem in that when content material is injected, air bubbles tend to be mixed into the content material. Such an air bubble mixture means that air remains in the
5 final packaged product. For example, if the content material is food, such an existence of air therein contributes to the quality degradation of the content material.

The present invention has been made with a view to solving the above-described problems, and an object of the present invention is to
10 provide a vertical filling-packaging machine capable of feeding fluidized content material into a tubular film with good quantitative accuracy and with few air bubbles mixed into the content material.

Disclosure of the Invention

15 In order to achieve the above object, a vertical filling-packaging machine comprises: an injection nozzle for feeding content material that is fluidized into a tubular film that includes a bottom portion; transport means for transporting the tubular film downward in a state in which the content material is fed thereinto; and a lateral sealing mechanism for tightly sealing
20 the tubular film by heat sealing a portion of the tubular film,

wherein the vertical filling-packaging machine manufactures a packaged product by a series of packaging operations including at least following operations: an operation of feeding the content material through the injection nozzle; an operation of transporting the tubular film downward in a
25 state in which the content material is fed thereinto; and an operation of heat

sealing by the lateral sealing mechanism,

wherein an injection port of the injection nozzle is configured to be immersed in the content material throughout entirety of the series of packaging operations, and the operation of feeding the content material starts in a state in which the injection port of the injection nozzle is immersed in the content material.

According to the packaging machine of the above present invention, the operation of feeding the content material starts in a state in which the injection port of the injection nozzle is immersed in the content material. Therefore, compared to the proposed feeding method as shown in Figure 2, bubbles of air or the like are difficult to be mixed into the content material.

In addition, the injection port of the injection nozzle is configured to be always immersed in the content material during the series of packaging operations (in other words, the injection port of the injection nozzle is configured not to be opened to air), so that the inside of the injection nozzle is configured not to be emptied. Therefore, compared to the proposed feeding method as shown in Figure 2, the quantitative accuracy of the content material to be fed is improved.

The above vertical filling-packaging machine may further include a pair of squeezing rollers which pinches the portion of the tubular film in which the fed content material is present, and which rotates in a state in which the pair of squeezing rollers which pinches the portion of the tubular film in which the fed content material is present, thereby forming a flat void-filled portion on the tubular film and transporting the tubular film downward. The operation of feeding the content material may be to feed the content material

into the tubular film that is located higher than the portion that is pinched by the pair of squeezing rollers. In this case, the content material that has been accumulated in a position higher than that of the squeezing rollers may be dropped downward into the tubular film located lower than the squeezing rollers at the same time when the pair of squeezing rollers is opened, and after the content material is dropped, liquid level of the content material may be configured to be higher than the injection port of the injection nozzle.

The above vertical filling-packaging machine may further include a content material feeding mechanism including: a reservoir tank for reserving the content material; a feed passage for transferring the content material from the reservoir tank to the injection nozzle; pump means used as a driving source for transferring the content material from the reservoir tank to a side of the injection nozzle; a return passage for returning the content material from the side of the injection nozzle to the reservoir tank; and valve means capable of switching between an operation of feeding the content material, which has been transferred through the feed passage, into the tubular film through the injection nozzle and an operation of returning the content material, which has been transferred through the feed passage, back to a side of the reservoir tank.

The above vertical filling-packaging machine may further include a film feeding device which holds two feed rolls, joins an end portion of a first film drawn from one of the feed rolls to an end portion of a second film drawn from the other of the feed rolls, and feeds the joined first and second films as a long film; and a vertical sealing mechanism which performs vertical sealing on side edge portions of the long film along a longitudinal direction of the

long film so as to change the long film into the tubular film. The above vertical filling-packaging machine may be configured such that the vertical sealing mechanism performs vertical sealing on a joint portion in which the first film and the second film are joined in a state in which an operation of transporting the long film is terminated, and the valve means of the content material feeding mechanism is switched to a position on a side of returning the content material to the side of the reservoir tank while the vertical sealing operation is being performed on the joint portion. In this case, the time to perform vertical sealing on the joint portion may be configured to be longer than the time to perform an ordinary vertical sealing so as to prevent the content material from leaking from a vertical sealed portion formed by the vertical sealing.

As described above, according to the vertical filling-packaging machine of the present invention, the operation of feeding content material starts in a state in which the injection port of the injection nozzle is inside the content material, whereby the content material can be fed with good quantitative accuracy, and air bubbles mixed into the content material can be minimized.

Brief Description of the Drawings

Figure 1A illustrates an example of a proposed packaging operation;
Figure 1B illustrates an example of a proposed packaging operation;
Figure 1C illustrates an example of a proposed packaging operation;
Figure 1D illustrates an example of a proposed packaging operation;
Figure 1E illustrates an example of a proposed packaging operation;

Figure 2A explains a problem that a proposed packaging operation has;

Figure 2B explains a problem that a proposed packaging operation has;

5 Figure 3 schematically illustrates an example of a vertical filling-packaging machine of the present invention;

Figure 4 is a perspective view explaining a joint portion between films;

Figure 5 illustrates a configuration of a content material feeding mechanism, one of features of the present invention;

10 Figure 6 illustrates a pillow type packaging bag capable of being manufactured by the packaging machine of Figure 3;

Figure 7A is a process view explaining a packaging operation of the packaging machine of Figure 3;

15 Figure 7B is a process view explaining a packaging operation of the packaging machine of Figure 3;

Figure 7C is a process view explaining a packaging operation of the packaging machine of Figure 3;

Figure 7D is a process view explaining a packaging operation of the packaging machine of Figure 3;

20 Figure 7E is a process view explaining a packaging operation of the packaging machine of Figure 3;

Figure 8 is a timing chart showing the timing of the operation of an individual component of the packaging machine of Figure 3;

Figure 9 illustrates a packaging bag including a joint portion of films;

25 Figure 10A illustrates a configuration of an injection nozzle of the packaging machine of Figure 3; and

Figure 10B illustrates another configuration of the injection nozzle of the packaging machine of Figure 3.

Description of Symbols

5	1A, 1B	Film
	1'	Tubular film
	2	Void-filled portion
	5	Joint portion
	10	Vertical filling-packaging machine
10	10A	Film feeding mechanism
	14	Folding guide
	15	Injection nozzle
	15a	Lower end
	17	Injection port
15	20	Content material feeding mechanism
	30	Vertical sealing mechanism
	41	Transport roller
	45	Squeezing roller
	60	Lateral sealing mechanism
20	61	Heater bar
	62	Heater bar receiver
	71	Joint sealer
	83	Sensor
	91, 92	Packaging bag
25	F1	Vertical sealed portion
	F2	Lateral sealed portion

Ra, Rb Feed roll

Best Mode for Carrying Out the Invention

As shown in Figure 3, packaging machine 10 of the present
5 embodiment includes film feeding mechanism 10A that draws a film from
feed rolls Ra and Rb, and joins film 1A and film 1B as needed. Further,
packaging machine 10 includes packaging mechanism 10C that forms the
film unrolled from film feeding mechanism 10A into a tubular shape, and that
continuously manufactures a packaging bag by forming a vertical sealed
10 portion and a lateral sealed portion thereon as needed.

As film feeding mechanism 10A, a proposed film feeding mechanism,
which includes a general configuration for such a packaging machine, can be
used. Film feeding mechanism 10A shown in Figure 3 uses two feed rolls
Ra and Rb, and is configured such that, for example, when film 1A of feed
15 roll Ra has been used up, film 1B of feed roll Rb is continuously unrolled. It
should be noted that Figure 3 shows that film 1A is drawn into a side of the
packaging mechanism 10C as a film on the using side, and that film 1B is
held in the vicinity of joint sealer 71 as a film on the standby side.

A configuration is made such that, for example, sensor 83 can detect
20 that film 1A on the using side runs short, and joint sealer 71 is driven on the
basis of the detected result. Thus, the end portion of using side film 1A and
the end portion of standby side film 1B are heat-sealed so as to join the two
films together. More specifically, as shown in Figure 4, two films 1A and 1B
are partially overlapped and two films are joined together by forming sealed
25 portion 3. The region in which these two films are overlapped and the region

in which sealed portion 3 is formed is called "joint portion 5".

According to packaging machine 10 of the present embodiment, the use of film feeding mechanism 10A as described above allows a film to be continuously fed into packaging mechanism 10C. Such a capability of
5 continuously feeding a film is very advantageous in that there is no need to temporarily terminate manufacturing a packaging bag.

Now going back to Figure 3, packaging mechanism 10C will be described. It should be noted that packaging mechanism 10C is the same as the vertical filling-packaging machine disclosed in the Applicant's
10 Japanese Patent Laid-Open No. 2004-276930.

Packaging mechanism 10C includes folding guide 14 for folding a film into a tubular shape; vertical sealing mechanism 30 which performs vertical sealing on the side edges of films folded by folding guide 14 to form vertical sealed portion F1 (see Figure 6) and to form tubular film 1'; and a pair of
15 transport rollers 41, a pair of squeezing rollers 45 and lateral sealing mechanism 60, each of which arranged on the downstream side in the film transport direction from vertical sealing mechanism 30.

Vertical sealing mechanism 30 is provided with heater bar 31 incorporating heating means such as a heater. Heater bar 31 is configured
20 to be able to advance and retreat (in the lateral direction in the figure) with respect to the film and also to move back and forth in the up/down direction in the figure, thereby providing a box-shaped motion as shown by arrow A₃₀ of Figure 3.

Vertical sealing mechanism 30 performs sealing operation as follows.
25 First, heater bar 31 moves in the direction of coming close to a film while in a

state remaining at an ascending end position thereof, thereby allowing the film to be pinched between heater bar 31 and a main pipe (not shown). Then, in this pinched state, heater bar 31 moves downward in Figure 3 in synchronism with the film transport. The film to be heat-sealed receives heat
5 from heater bar 31, and both side edges of the film are joined together. When heater bar 31 reaches a descending end position thereof, heater bar 31 moves away from the film and returns to the original height.

The above vertical sealing operation is repeated to form a continuous vertical sealed portion on an overlapped portion of both side edges of the
10 film. The vertical sealing mechanism performing such a box-shaped operation has an advantage of being capable of forming a vertical sealed portion without terminating the film transport.

It should be noted that tubular film 1' is transferred in a state of including a substantially circular cross section, namely, in a state of including
15 a space inside tubular film 1' until tubular film 1' passes through vertical sealing mechanism 30. When tubular film 1' goes further downstream, tubular film 1' is changed into a flat pressed shape by a guide plate (not shown) provided between vertical sealing mechanism 30 and transport rollers 41.

20 Transport rollers 41 are arranged so as to pinch both side edges in the width direction of tubular film 1' pressed in this manner. Transport rollers 41 are one of film transport means in packaging mechanism 10C. When rotated, transport rollers 41 transport tubular film 1' downward.

A pair of squeezing rollers 45 pinches the tubular film so as to divide
25 filling material injected into the tubular film. When squeezing rollers 45 are

rotated in this state, a void-filled portion including no filling material therein is formed on the tubular film, and the tubular film is transported downward. An advantage of forming such a flat void-filled portion is to enable the suppression of the occurrence of sealing failure during the lateral sealing operation described below.

Lateral sealing mechanism 60 includes heater bar 61 incorporating heating means such as a heater, and heater bar receiver 62 arranged facing heater bar 61. The pair of members is used to pinch tubular film 1' and heat the film, thereby forming lateral sealed portion F2 (see Figure 6) on the film.

Heater bar 61 and heater bar receiver 62 are configured to perform a box-shaped motion in the same way as for vertical sealing mechanism 30. More specifically, as shown by arrow A₆₀ of Figure 3, heater bar 61 and heater bar receiver 62 with tubular film 1' pinched therebetween move downward in synchronism with the film transport. Heater bar 61 and heater bar move away from the film at the descending end position, and go back to the original position again.

It should be noted that heater bar 61 incorporates a cutter (not shown) for separating a packaging bag from tubular film 1' by cutting lateral sealed portion F2. In addition, in response thereto, heater bar receiver 62 includes a relief groove formed so as to provide space between the protruded cutter and heater bar receiver 62.

Subsequently, the content material feeding mechanism, one of features of the packaging machine of the present embodiment, will be described with reference to Figure 5. It should be noted that vertical sealing mechanism 30 is not shown in Figure 5, but this is not an essential matter.

As shown in Figure 5, content material feeding mechanism 20 includes reservoir tank 22 for reserving the content material; feed passage 21a for transferring the accumulated content material to injection nozzle 15; and pump 23 used as a driving source for transferring the content material.

5 Further, in the present embodiment, there is return passage 21b for returning the content material from a side of the injection nozzle 15 to a side of the reservoir tank 22. Three-way-valve 25 is provided to switch between the operation (referred to as "first mode") of feeding the content material transferred to a side of the injection nozzle into the tubular film and the

10 operation (referred to as "second mode") of returning the content material through return passage 21b back to reservoir tank 22.

When three-way-valve 25 is switched to "first mode" in a state in which pump 23 is being driven, the content material is fed into tubular film 1' through injection nozzle 15. On the contrary, when three-way-valve 25 is

15 switched to "second mode" in a state in which pump 23 is being driven, the operation of feeding the content material into the tubular film is terminated, and the content material is returned to a side of the reservoir tank 22 through return passage 21b.

Such a configuration is advantageous in that the operation of feeding

20 the content material into the tubular film can be controlled simply by switching three-way-valve 25 while pump 23 is being driven. In general, it takes some time to stabilize the feed rate of pump 23. If intermittent feeding is performed by switching on/off pump 23, the amount of content material to be fed may vary.

25 In contrast, according to the configuration of the present embodiment,

there is no need to terminate driving the pump and the pump feed rate is stable. Therefore, it is difficult for such a problem to occur. In addition, from another point of view, the fact that it is not necessary to terminate and to start driving the pump means that the burden applied to the pump is relieved, and thus pump failure can be minimized.

The type of the packaging bag manufactured by the vertical filling-packaging machine of the present invention is not limited to the type described above, but may be a packaging bag as shown in Figure 6. Packaging bag 91 is a so-called pillow type packaging bag in which two lateral sealed portions F2a and F2b (hereinafter collectively referred to as "F2") and vertical sealed portion F1 serving as a backlining are formed. The inside of packaging bag 91 is filled with fluidized content material (e.g., liquid). Vertical sealed portion F1 is a heat-sealed portion formed by vertical sealing mechanism 30, and lateral sealed portion F2 is a heat-sealed portion formed by lateral sealing mechanism 60.

Next, an example of the packaging operation by packaging machine 10 of the present embodiment configured as above will be described with reference to Figures 7 and 8. Figure 7 is a process view explaining the packaging operation of packaging machine 10, and Figure 8 is a timing chart showing the timing of the operation of an individual component thereof.

(Basic packaging operation)

First, the basic operation for manufacturing one packaging bag 91 will be described.

Figure 7A illustrates the initial state of a series of packaging operations, which corresponds to the state of time "t_A" in Figure 8. As shown

in Figure 7A, lateral seal portion F2 formed in the previous process is formed at the lower end portion of tubular film 1', thereby allowing tubular film 1' to have a bottom portion. A pair of squeezing rollers 45 and lateral sealing mechanism 60 are both in a state of being open.

5 Content material has already been injected into tubular film 1', and the liquid level thereof is located in a position (height h_1) higher than lower end 15a of the injection nozzle. In other words, lower end 15a of the injection nozzle is in a state of being immersed into the content material. When lower end 15a is exposed to air, the content material inside the nozzle is dropped
10 into the tubular film by its own weight, and thus the inside of the nozzle is in an empty state. In contrast, according to configuration of the present embodiment, since lower end 15a of the nozzle is immersed into the content material, the content material is not dropped, and the inside of the nozzle remains in a state of being filled with the content material.

15 Then, as shown in Figure 7B (see time " t_b " of Figure 8), the pair of squeezing rollers 45 pinches a portion of tubular film 1', in which the content material is present, therebetween. Thus, the content material in tubular film 1' is divided into upper and lower portions. Such an operation of squeezing rollers 45 to pinch a portion in which the content material is present assures
20 that air does not remain inside packaging bag 91. The operation of feeding content material into the tubular film has already started since the initial state as shown in Figure 7A. Therefore, in the process of Figure 7B, the liquid level rises to a level of being slightly higher than h_1 .

 Then, as shown in Figure 7C (see time " t_c " of Figure 8), individual
25 squeezing rollers 45 are rotated as shown by arrows in the figure while the

operation of feeding the content material is continued, namely, without the feeding operation thereof being terminated. Hence, flat void-filled portion 2 including no content material therein is formed on tubular film 1', which is transferred downward. It should be noted that although not shown in Figure 7, the feeding operation is configured such that transport rollers 41 (see
5 Figure 3) are also rotatably driven in synchronism with the rotation of squeezing rollers 45, thereby supporting the film transport.

After void-filled portion 2 is transferred to a position to be pinched by lateral sealing mechanism 60, lateral sealing mechanism 60 pinches void-
10 filled portion 2 and the lateral sealing operation starts.

Then, as shown in Figure 7D (see time " t_D " of Figure 8), in a state in which the tubular film is pinched by lateral sealing mechanism 60, lateral sealing mechanism 60 is moved downward in synchronism with the rotation of squeezing rollers 45. While being pinched by lateral sealing mechanism
15 60, tubular film 1' is heated, thereby forming lateral sealed portion F2. Although detailed operation is not shown in the figure, after lateral sealing mechanism 60 reaches the descending end position, a cutter incorporated in the heater bar is protruded to cut and separate the packaging bag. During this process, the operation of feeding the content material continues, and the
20 fed content material is accumulated to a level higher than the position of squeezing rollers 45. Liquid level height h_2 in this process is the highest of all in the series of packaging operations, corresponding to the liquid level height "high" of Figure 8.

Then, as shown in Figure 7E (see time " t_E " of Figure 8), both the
25 operations of pinching the film by lateral sealing mechanism 60 and the pair

of squeezing rollers 45 are stopped. Thereby, one packaging bag 91 filled with content material is obtained, and at the same time, content material that has been accumulated to a level higher than the position of squeezing rollers 45 is dropped downward into tubular film 1'.

5 What matters in the process of Figure 7E is that a feeding operation is configured such that after the content material is dropped downward, the liquid level of the content material is higher than the position of lower end 15a of the nozzle (specifically, the same liquid level height h_1 as the initial state). Such a configuration assures that lower end 15a of the nozzle
10 remains to be immersed in the content material continuously during the series of packaging operations. Therefore, even after the content material inside the nozzle is dropped downward, the inside of the nozzle is not emptied. According to such a configuration in which the inside of the nozzle is filled with the content material and the operation of feeding the content
15 material starts in this state, the content material can be fed with a very favorable quantitative accuracy. However, if the content material is injected in a state in which the lower end of the nozzle is exposed and where the inside of the nozzle is emptied, bubbles of air or the like are mixed into the liquid while the content material is being dropped downward. However, the
20 above configuration can prevent such a problem from occurring.

As shown in Figure 7E, finally, lateral sealing mechanism 60 is moved back to the original position and the packaging machine returns to the initial state of Figure 7A. Packaging bag 91 can be continuously manufactured by repeatedly performing the series of packaging operation as described above.

25 With respect to the above described packaging operation, more

specifically, the time per cycle shown in Figure 8 may be, for example, 1.0 second. With respect to the operation of squeezing rollers 45, the time when squeezing rollers 45 are opened may be set to 0.4 seconds (corresponding to the individual process of Figures 7A and 7E), and the time when
5 squeezing rollers 45 are closed may be set to 0.6 seconds (corresponding to the individual process of Figures 7B to 7E).

(Packaging operation with respect to film joint portion)

By the way, if the filled content material is liquid or the like, and a sealing failure occurs in sealed portion F1 or F2, or joint portion 5 of
10 packaging bag 10, the content material may leak from that place. For this reason, the individual sealed portions of such a packaging bag need to be reliably heat-sealed.

This will be described with reference to Figure 9. As shown in the figure, if joint portion 5 of the films is located on the bellows of packaging bag
15 92, and, for example, if a sealing failure occurs in vertical sealed portion F1' including joint portion 5, the content material will leak from that place. In particular, joint portion 5 is a portion where two films are overlapped, and thus, insufficient heat sealing in the vertical sealing operation may cause insufficient sealing strength. Accordingly, it is preferable to sufficiently heat
20 seal vertical sealed portion F1' including the joint portion.

However, since packaging bag 92 includes joint portion 5, the bag may be a defective product in the first place. Therefore, it is considered that such a packaging bag does not have to be filled with the content material. However, if the content material is not fed into the packaging bag, the
25 following problem may occur.

For example, there is no problem in a case in which packaging bag 91 follows packaging bag 92 as shown in Figure 9, but, if packaging bag 91 has already been cut and separated, emptied packaging bag 92 is in a state of hanging down at the bottom of the tubular film. Since packaging bag 92 is emptied, the tensile force, which is due to the weight of content material in packaging bag 92, is not applied to the tubular film. Therefore, the emptied packaging bag 92 may swingly move to be in contact with heater bar 61 (see Figure 6). If packaging bag 92 is in contact with heater bar 61, the film may melt to adhere to the heater bar, which will disturb the film transport. In order to prevent such problem, it is preferable to feed the content material into packaging bag 92 in the same way as for other packaging bags.

The vertical sealing operation is configured such that the time of the vertical sealing operation to be performed in a region including joint portion 5 is longer than the time of an ordinary vertical sealing operation. Here, the "ordinary vertical sealing operation" refers to vertical sealing that is to be performed on a region not including joint portion 5. For example, the time of the ordinary vertical sealing operation may be 1 second; and the time of the vertical sealing operation that is to be performed in a region including joint portion 5 (hereinafter referred to as "film joint vertical sealing operation") may be 4 seconds.

The film joint vertical sealing operation will be described with reference to the timing chart of Figure 8 again.

This vertical sealing operation starts when joint portion 5 of the films reaches the position to be pinched by vertical sealing mechanism 30. For example, a sensor (not shown) for detecting joint portion 5 may be used to

detect whether joint portion 5 reaches the position to be pinched by vertical sealing mechanism. Alternatively, back calculation may be made from the relation between the distance from joint sealer 71 (see Figure 3) to vertical sealing mechanism 30 and the length of a film transferred per cycle; and
5 after a predetermined number of ordinary vertical sealing operations is performed, the film joint vertical sealing operation may start.

The film joint vertical sealing operation starts when, as shown by time " t_H " of Figure 8, the film transport is terminated, squeezing rollers 45 are opened, and the liquid level height is "high" (see Figure 7D). According to
10 the vertical sealing operation, the time when vertical sealing mechanism 30 pinches the film is set to, for example, 2.0 to 3.0 seconds. Since the pinching time for the ordinary vertical sealing operation is 0.4 seconds, the pinching time for the film joint vertical sealing operation is about five times longer than the ordinary time.

15 Three-way-valve 25 (see Figure 4) is switched at time t_H when the content material transferred from reservoir tank 22 is returned to reservoir tank 22 through return passage 21b. Here, pump 23 continues to be driven, so that the content material circulates from feed passage 21a through the three-way-valve and return passage 21b to reservoir tank 22.

20 As described above, during the film joint vertical sealing operation, the content material is configured to circulate, thereby preventing more content material than is necessary from being fed into tubular film. The feeding of the content material can be controlled, for example, by temporarily terminating the driving of pump 23. However, as described above,
25 controlling the feeding of the content material by turning on/off the pump

tends to cause the amount of feeding content material to vary. In contrast, the present embodiment is configured to control the feeding of the content material just by switching three-way-valve 25 while pump 23 is being driven. Since the feeding rate of pump 23 is stable, it is difficult for a problem such as a reduction in quantitative accuracy to occur.

The use of three-way-valve 25 to switch the feeding of the content material has another advantage in which a change in the quality of the content material can be prevented. The vertical sealing operation of joint portion 5 of films needs to terminate the packaging operation only for several seconds, but for some reason, there may be a case in which terminating the packaging operations for a longer time may be required. In such a case, if the content material remains unmoved in a pipe while the feeding operation is being terminated, a change in temperature may cause the viscosity of the content material to be changed. The change in viscosity may cause the amount of feeding content material that is being fed into tubular film to vary. For this reason, as in the present embodiment, it is preferable to ensure that the content material is being circulated during the time when the feeding operation is being terminated, thereby assuring uniform temperature of the content material and suppressing the above problem from occurring.

After the above vertical sealing operation is performed for a predetermined time, as shown by time t_1 (see Figure 8), an ordinary packaging operation is resumed. More specifically, squeezing rollers 45 are opened, the content material is dropped downward (see Figure 7D), three-way-valve 25 is switched, and the operation of feeding the content material into tubular film is resumed. Subsequently, the ordinary packaging operation

is repeated as described above so as to continuously manufacture packaging bags.

Hereinbefore, an embodiment of the present invention has been described, but the present invention is not limited to the above configuration and various modifications can be made. For example, the packaging bag is not limited to the pillow type, but a three-way seal type or a four-way seal type may be used. For the pillow type, vertical sealed portion F1 (see Figure 6) thereof is not limited to this, but a so-called butt-seam type or an envelope type may be used.

Both vertical sealing mechanism 30 and lateral sealing mechanism 60 of the packaging machine shown in Figure 3 perform a box-shaped motion, but the present invention is not limited to this, and a general vertical sealing mechanism and lateral sealing mechanism for performing heat sealing in situ without moving up and down may be used. Packaging machine 10 of Figure 3 is provided with the pair of squeezing rollers 45, but the present invention is not limited to this, and may be configured as a packaging machine without a squeezing roller.

With respect to injection nozzle 15, as shown in Figure 10A, the injection port thereof may be formed at lower end 15a of the nozzle or as shown in Figure 10B, injection port 17 may be formed on the outer periphery surface of the nozzle. For the configuration of Figure 10B, liquid level height h1 can be located higher than injection port 17 after squeezing rollers 45 are opened as shown in Figure 7E. This assures that injection port 17 is not exposed to air, and the content material inside the nozzle is not dropped into the tubular film and remains in the nozzle. As a result, the same advantage

of the present invention as described above can be obtained.

CLAIMS

1. A vertical filling-packaging machine comprising:
an injection nozzle for feeding content material that is fluidized into a
tubular film that includes a bottom portion;

5 transport means for transporting the tubular film downward in a state
in which the content material is fed therein; and

a lateral sealing mechanism for tightly sealing the tubular film by heat
sealing a portion of the tubular film,

wherein the vertical filling-packaging machine manufactures a
10 packaged product by a series of packaging operations including at least
following operations: an operation of feeding the content material through the
injection nozzle; an operation of transporting the tubular film downward in a
state in which the content material is fed therein; and an operation of heat
sealing by the lateral sealing mechanism,

15 wherein an injection port of the injection nozzle is configured to be
immersed in the content material throughout entirety of the series of
packaging operations, and the operation of feeding the content material
starts in a state in which the injection port of the injection nozzle is immersed
in the content material.

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2. The vertical filling-packaging machine according to claim 1, further
comprising a pair of squeezing rollers which pinches the portion of the
tubular film in which the fed content material is present, and which rotates in
a state in which the pair of squeezing rollers which pinches the portion of the
25 tubular film in which the fed content material is present, thereby forming a flat

void-filled portion on the tubular film and transporting the tubular film downward,

wherein the operation of feeding the content material is to feed the content material into the tubular film that is located higher than the portion
5 that is pinched by the pair of squeezing rollers.

3. The vertical filling-packaging machine according to claim 2, wherein the content material that has been accumulated in a position higher than that of the squeezing rollers is dropped downward into the tubular film located
10 lower than the squeezing rollers at the same time when the pair of squeezing rollers is opened, and

after the content material is dropped, liquid level of the content material is configured to be higher than the injection port of the injection nozzle.

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4. The vertical filling-packaging machine according to any one of claims 1 to 3, further comprising a content material feeding mechanism including: a reservoir tank for reserving the content material; a feed passage for transferring the content material from the reservoir tank to the injection
20 nozzle; pump means used as a driving source for transferring the content material from the reservoir tank to a side of the injection nozzle; a return passage for returning the content material from the side of the injection nozzle to the reservoir tank; and valve means capable of switching between an operation of feeding the content material, which has been transferred
25 through the feed passage, into the tubular film through the injection nozzle

and an operation of returning the content material, which has been transferred through the feed passage, back to a side of the reservoir tank.

5 5. The vertical filling-packaging machine according to claim 4, further comprising:

 a film feeding device which holds two feed rolls, joins an end portion of a first film drawn from one of the feed rolls to an end portion of a second film drawn from the other of the feed rolls, and feeds the joined first and second films as a long film; and

10 a vertical sealing mechanism which performs vertical sealing on side edge portions of the long film along a longitudinal direction of the long film so as to change the long film into the tubular film,

 wherein the vertical sealing mechanism performs vertical sealing on a joint portion in which the first film and the second film are joined in a state in
15 which an operation of transporting the long film is terminated, and

 the valve means of the content material feeding mechanism is switched to a position on a side of returning the content material to the side of the reservoir tank while the vertical sealing operation is being performed on the joint portion.

20 6. The vertical filling-packaging machine according to claim 5, wherein the time to perform vertical sealing on the joint portion is longer than the time to perform an ordinary vertical sealing so as to prevent the content material from leaking from a vertical sealed portion formed by the vertical sealing.
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