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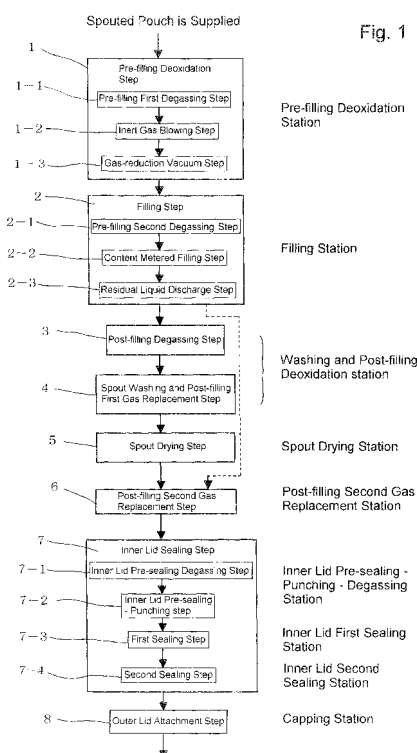
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(54) **METHOD OF PACKING LIQUID FILLING INTO SPOUTED POUCH AND SEALING THE POUCH AND APPARATUS THEREFOR**

(57) [PROBLEMS] To obtain a spouted pouch package having a high degree of deoxidation by a method in which even a liquid content which is easily foamable can be filled while being inhibited from foaming.

[MEANS FOR SOLVING PROBLEMS] A pre-filling deoxidation step (1) is performed before a liquid content is filled into a pouch. The pre-filling deoxidation step (1) comprises: a vacuum step (1-1) in which a gas is evacuated from the pouch; an inert gas blowing step (1-2) in which an inert gas is blown into the pouch after the vacuum step; and a gas-reduction vacuum step (1-3) in which the gas in the pouch after the inert gas blowing step is discharged under vacuum to reduce the gas in the pouch to a predetermined amount. Thereafter, the pouch is evacuated in a pre-filling second degassing step (2-1) and then filled with a content. After filling, gas replacement is implemented.



DescriptionTECHNICAL FIELD

[0001] The present invention relates to a method for filling and sealing a liquid content in a spouted pouch and to an apparatus therefor, and more particularly to a method for filling and sealing a liquid content in a spouted pouch that is advantageously suitable for filling and sealing a liquid content that is easily foamed and requires high-level deoxidation packaging.

BACKGROUND ART

[0002] Filling and sealing liquid food products such as refreshing beverages, jelly foods, and high-calorie or highly nutritional rice gruel in spouted pouches has recently been suggested. Among such products, for example, when the content is a low-acidic product that has a pH of equal to or higher than 4.6 and easily decomposes, sterilization at a temperature of equal to or higher than 100°C is required and retort sterilization is conducted after filling and sealing the liquid content. Furthermore, the spout opening end is sealed by fusing an inner lid sealing material such as an aluminum foil composite film after filling. In a case of a comparatively small pouch, the pouch is conventionally filled with the content by pouring the content via a spout. In such a case, a filling and sealing method is required that can reliably prevent the content flavor from changing due to oxidation and also the content itself from decomposition or deterioration caused by putrefactive bacteria and can maintain purity, and the required operations include washing the outer peripheral portion of the spout after filling, purging a head space with nitrogen gas for removing oxygen from the head space, and reliable sealing of the spout opening end with an inner lid sealing material for reliable hermeticity. However, because the spout aperture is small, the following problems are encountered: the content overflows during and after the filling operation, the spout opening end and outer peripheral portion are easily contaminated, gas purging is difficult to conduct, high-speed filling is difficult to perform, and high-speed productivity is impossible. The occurrence frequency of these problems rises dramatically when an easily foamable content is used. Among the above-described content, the low-acidic content is especially easily foamed, and the aforementioned problems have to be resolved when such a content is filled and sealed in a spouted pouch.

[0003] The spout opening is easily contaminated mainly because of liquid sagging from a filling nozzle during filling or after filling and also because the content is easily spilled from the spout under the effect of impacts during conveying to a subsequent sealing step in a state with a high liquid level. This state occurs because filling of the pouch with the content is started from a state in which the front and rear surfaces of the pouch are flatly stacked and the spout opening is closed by the filling nozzle during filling. As a result, the air cannot penetrate inside, the pouch cannot expand sufficiently under the effect of content weight alone because of pouch rigidity, and a state with a high liquid level is assumed. The adhesion of content to the opening end portion of the spout is undesirable not only because of poor heat sealing of the inner lid sealing material to the opening in the subsequent step, but also from the standpoint of sanitary. For this reason, a method has been suggested by which filling is performed in a state in which the body walls of the pouch during filling are expanded by suction from the outside, or by which the air is blown into the pouch from the filling nozzle in the filling station after the filling in order to expand the pouch, thereby discharging the liquid remaining in the nozzle. Moreover, the liquid level is lowered and the spouted pouch is conveyed in such a state to the next step, thereby preventing the liquid from spilling during conveying (see Patent Document 1). Furthermore, washing of the outer peripheral portion of the spout is performed after the filling with the liquid content. The following methods have been suggested for washing the outer peripheral portion of the spout: a method by which a ring-shaped washing device having a plurality of spraying ports on the inner periphery is lowered to a height at which it is close to a container opening in a washing and post-filling deoxidation station that is provided after the filling station, and washing is performed by blowing water from the spraying ports on the entire outer periphery of the container opening (see Patent Document 2), and a method by which the outer peripheral portion of the spout is washed by spraying washing water on the outer peripheral portion of the spout in the spout opening washing apparatus in the washing step and also blowing compressed air into the pouch to expand the pouch and lower the liquid level therein (see Patent Document 3).

[0004] A gas replacement method has also been suggested that includes a gas replacement step in which an inert gas is blown via a spout into the pouch, following a spout drying step, gas replacement is performed with the inert gas blown into the pouch, the inner lid seal is then partially attached, and degassing is performed in this state by applying pressure to the side surfaces of the spout (see Patent Document 2).

Patent Document 1: Japanese Patent Application Laid-open No. 2001-328601

Patent Document 2: Japanese Patent Application Laid-open No. 11-227724

DISCLOSURE OF THE INTENTIONPROBLEM TO BE SOLVED BY THE INVENTION

[0005] All the above-described suggested methods for filling and sealing a liquid content in a spouted pouch contribute to increased cleanliness of the spout and increased level of deoxidation, but in a case of an easily foamable content, bubbles easily occur when compressed air is blown from the filling nozzle immediately after completion of filling, the bubbles flow out from the spout opening and contaminate the spout opening, and a large amount of bubbles remain inside the spout. The problem associated with the bubbles is that not only they are located in the head space, but also because the residual liquid is blown into the pouch by the compressed air, the bubbles (air) penetrate into the content and are present therein in the form of small gas bubbles. Furthermore, in gas replacement packaging in the conventional spouted pouches, gas replacement is performed by blowing an inert gas into the pouch that is temporarily expanded by air after filling, and degassing is performed thereafter. However, because the spout mouth is small, the air present in the spout is difficult to force out even by blowing the inert gas from the spout. Furthermore, even if the air of the head space is effectively replaced by the inert gas prior to sealing, the air that is present in the form of small bubbles in the content, as described hereinabove, exits into the head space after sealing, thereby degrading the deoxidation ratio. Therefore, a problem associated with improved deoxidation is yet to be resolved.

[0006] Accordingly, it is an object of the present invention to resolve the above-described problems arising when a spouted pouch is filled with an easily foamable liquid content and to provide a method for filling and sealing a liquid content into a spouted pouch that enables filling that effectively inhibits the occurrence of foaming even with the easily foamable content and can greatly increase the deoxidation efficiency, and also provide an apparatus for implementing such a method.

MEANS FOR SOLVING PROBLEMS

[0007] The inventors have conducted a comprehensive research aimed at the resolution of the above-described problems. The results obtained have demonstrated that foaming during filling is greatly affected by the external air, and although foaming can be reduced with respect to that of the conventional process by filling from a state in which the front and rear walls of a pouch body are flatly stacked rather than by filling in a state in which the pouch body is expanded from outside during filling, the foaming occurs when the residual liquid remaining in the end portion of the filling nozzle is foamed by the compressed air and the foam bubbles are blown into the pouch when the compressed air is blown in order to discharge the residual liquid present in the nozzle and expand the pouch after filling. These bubbles are present in the head space and also penetrate in the form of small gas bubbles into the liquid content. It has also been found that the expansion of the pouch causes the presence of a large amount of air inside the pouch and this air is difficult to replace completely with inert gas. Furthermore, a method that suppresses the occurrence of bubbles and enables effective sealing with a high gas replacement ratio has been developed based on the results of subsequent research, and a patent application disclosing this method has been filed (Japanese Patent Application No. 2006-18205). The invention of the present application is an improvement over the invention of the aforementioned prior application and can greatly increase the deoxidation ratio by providing a pre-filling deoxidation step, makes it possible to perform the pre-filling degassing step efficiently, and improves the speed of production line.

[0008] Thus, a method for filling and sealing a liquid content in a spouted pouch according to the invention as set forth in claim 1 that resolves the above-described problems is a method for filling and sealing a liquid content in a spouted pouch which is deoxidized, filled with the liquid content and sealed, including: a pre-filling deoxidation step of removing air from the spouted pouch prior to content filling, a pre-filling degassing step of degassing the spouted pouch immediately prior to content filling, a filling step of filling the spouted pouch with the liquid content, and a post-filling gas replacement step of blowing an inert gas into the pouch filled with the content and performing gas replacement.

[0009] The invention as set forth in claim 2 is the invention as set forth in claim 1, **characterized in that** the pre-filling deoxidation step includes a vacuum step of evacuating the air from the pouch, an inert gas blowing step of blowing the inert gas into the pouch after the vacuum step, and a gas-reduction vacuum step of evacuating the gas inside the pouch after the inert gas blow step and reducing the amount of gas inside the pouch to a predetermined amount. The invention as set forth in claim 3 is the invention as set forth in claim 2, **characterized in that** the vacuum step is carried out in an inert gas atmosphere by injecting the inert gas in the vicinity of the spout. The invention as set forth in claim 4 relates to the method for filling and sealing a liquid content in a spouted pouch according to claim 1, further including, before the post-filling gas replacement step, a post-filling degassing step of pressurizing the pouch filled with the content and pressing out the gas and bubbles contained in the pouch. The invention as set forth in claim 5 relates to the method for filling and sealing a liquid content in a spouted pouch according to claim 1, **characterized in that** the filling step includes

a residual liquid discharge step of pushing out with a rod a residual liquid that has adhered to a nozzle after the liquid content has been filled and causing the residual liquid to fall down inside the pouch. The invention as set forth in claim 6 relates to the method for filling and sealing a liquid content in a spouted pouch according to claim 1, **characterized in that** the pre-filling degassing step includes pressurizing the pouch from outside and degassing the inside of the pouch.

The invention as set forth in claim 7 relates to the method for filling and sealing a liquid content in a spouted pouch according to claim 1, further including a washing step of washing an outer peripheral portion of the spout after the filling step, wherein the washing step and the post-filling gas replacement step are performed simultaneously in the same station.

[0010] An apparatus for filling and sealing a liquid content in a spouted pouch according to the invention as set forth in claim 8 that is used for implementing the above-described method includes: pouch conveying means for conveying a pouch by grasping a spout portion of the pouch, pre-filling deoxidation means for discharging air from the spouted pouch prior to content filling, pre-filling degassing means for discharging gas in the pouch immediately prior to content filling, this means being disposed downstream of the pre-filling deoxidation means, filling means for filling a content into the pouch via the spout, and post-filling gas replacement means for blowing inert gas into the pouch.

The invention as set forth in claim 9 relates to the apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, **characterized in that** the pre-filling deoxidation means includes vacuum means for evacuating the air inside the pouch, inert gas blow means for blowing an inert gas into the pouch after the vacuum step, gas-reduction vacuum means for evacuating the gas in the pouch after the inert gas blowing step and reducing the amount of gas inside the pouch to a predetermined amount, and inert gas injection means for supplying the inert gas to the vicinity of a joint portion of the gas-reduction vacuum means and the pouch and obtaining an inert gas atmosphere in the vicinity of the spout. The invention as set forth in claim 10 relates to the apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, further including, downstream of the filling means, post-filling degassing means for pressurizing the pouch filled with the content and pushing out the gas and bubbles contained in the pouch.

[0011] The invention as set forth in claim 11 relates to the apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, further including washing and post-filling gas replacement means for washing the spout and also blowing an inert gas into the pouch, and spout drying means for blowing an inert gas or air to dry the spout. The invention as set forth in claim 12 relates to the apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, **characterized in that** the filling means includes an outer tube having a filling nozzle, an outer rod in which the lower end portion serves as a valve body and closes the filling nozzle by seating on a valve seat, and an inner rod that is slidably fitted into the outer rod, has an outer diameter that enables mating with the filling nozzle, and pushes out a residual liquid contained in the filling nozzle. The invention as set forth in claim 13 relates to the apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, **characterized in that** the filling means includes an outer tube having a filling nozzle, a rod in which the lower end portion serves as a valve body and closes the filling nozzle by seating on a valve seat, and a mesh nozzle that is provided at the lower end portion of the filling nozzle and has a mesh screen in a discharge path thereof. The invention as set forth in claim 14 relates to the apparatus for filling and sealing a liquid content in a spouted pouch according to claim 11, **characterized in that** the washing and post-filling gas replacement means includes a nozzle body that has a washing water spraying port that sprays washing water toward the outer peripheral portion of the spout of the pouch, and a gas replacement nozzle that is positioned in the axial center of the nozzle body, covers an opening end of the spout of the pouch, and injects an inert gas into the spout. The invention as set forth in claim 15 relates to the apparatus for filling and sealing a liquid content in a spouted pouch according to claim 11, **characterized in that** the post-filling degassing means and the washing and post-filling gas replacement means are disposed in the same station, and a pre-filling deoxidation step of removing air from the pouch is provided before a step in which the degassing means is provided below the washing and post-filling gas replacement means.

EFFECT OF THE INVENTION

[0012] With the method and device in accordance with the present invention, oxygen is removed from the pouch before the filling step and the pouch is again degassed immediately prior to filling. Therefore, the inclusion of air into the content or occurrence of bubbles during filling is reduced and the packaging is performed with a high deoxidation ratio and can maintain high quality of the content, in particular such that can easily deteriorate under the effect of oxygen, these deoxidation ratio and maintained quality being superior to those attained with the conventional process in which gas replacement is performed after the pouch is directly filled with the content.

According to the invention as set forth in claim 2 and claim 9, the pre-filling deoxidation step includes a vacuum step, an inert gas blowing step, and a gas-reduction vacuum step. Therefore, a sufficient amount of inert gas can be blown into the pouch, without affecting the subsequent pre-filling degassing step, the pre-filling deoxidation ratio is high, and a portion that becomes bubbles after filling can be efficiently replaced with inert gas. Furthermore, because oxygen can be removed from the pouch before the filling step, the inclusion of air into the content or occurrence of bubbles during filling is reduced and the packaging is performed with a high deoxidation ratio and can maintain high quality of the

content, in particular such that can easily deteriorate under the effect of oxygen, these deoxidation ratio and maintained quality being superior to those attained with the conventional process in which gas replacement is performed after the pouch is directly filled with the content.

Furthermore, according to the invention as set forth in claim 3 and claim 9, the penetration of external air into the pouch, in particular after the pre-filling gas replacement, can be prevented and a transition to the content filling step can be made, while maintaining a high deoxidation ratio.

According to the invention as in claim 4 and claim 10, bubbles and gas that are present after filling are discharged from the container. Therefore, gas replacement that is subsequently performed can be performed effectively.

[0013] According to the invention as set forth in claims 5, 12, and 13, the residual liquid contained in the nozzle after the metered filling step can be filled into the pouch, without generating bubbles, and filling of easily foamable content is effectively performed. According to the invention as set forth in claim 6, because the pouch is pressurized from the outside and degassed immediately before the content filling step, the degassing time can be shortened, the content can be filled in a state in which the amount of oxygen inside the pouch is reduced, without hindering the increase in line rate, oxygen is prevented from dissolving in the content during filling, the occurrence of bubbles in the head space is prevented, the amount of oxygen present in a dissolved state in the content can be reduced, the deoxidation effect inside the pouch is increased, and content quality preservation can be improved.

According to the invention as set forth in claims 7 and 15, the degassing step and washing and gas replacement step can be effectively performed in the same station and are performed in the station following the filling station. Therefore, spilling of the content caused by impacts during conveying is reduced even without expanding the pouch to lower the level of liquid content in the filling station, and even if spilling occurs, it causes no problems because it occurs before the pouch is washed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

FIG. 1 is a block diagram illustrating principal steps of a method for filling and sealing a liquid content in a spouted pouch according to an embodiment of the present invention.

FIG. 2 is a schematic diagram illustrating a pre-filling deoxidation step of a method for filling and sealing a liquid content in a spouted pouch according to an embodiment of the present invention.

FIG. 3 is a schematic diagram illustrating a pre-filling deoxidation step of a method for filling and sealing a liquid content in a spouted pouch according to an embodiment of the present invention.

FIG. 4 is a principal cross-sectional view of a filling valve disposed in a filling station in the apparatus for filling and sealing a liquid content in a spouted pouch according to an embodiment of the invention; (a) shows a state in which the valve is open; (b) shows a state in which a filling port is closed; and (c) shows a state in which the residual liquid is pushed out.

FIG. 5 is a principal cross-sectional view of a filling valve in the apparatus for filling and sealing a liquid content in a spouted pouch according to another embodiment of the invention; (a) shows a state in which the valve is open; and (b) shows a state in which the valve is closed.

FIG. 6 illustrates a degassing step and a washing and gas replacement step performed with a degassing device and washing and gas replacement means disposed in a washing and post-filling deoxidation station in the apparatus for filling and sealing a liquid content in a spouted pouch according to an embodiment of the invention; (a) is a pouch cross-sectional view illustrating the state after a content filling step; (b) shows a state after completion of the degassing step; and (c) is a principal cross-sectional view illustrating the state after completion of the washing and gas replacement step.

EXPLANATION OF REFERENCE NUMERALS

[0015]

- 1 pre-filling deoxidation step
- 1-1 pre-filling first degassing step
- 1-2 pre-filling inert gas blowing step
- 2 filling step
- 2-1 pre-filling second degassing step
- 2-2 content metered filling step
- 2-3 residual liquid discharge step
- 3 post-filling degassing step

	4	spout washing and post-filling first gas replacement step
	5	spout drying step
	6	post-filling second gas replacement step
	7	inner lid sealing step
5	7-1	inner lid pre-sealing degassing step
	7-2	pre-sealing and punching step
	7-3	first sealing step
	7-4	second sealing step
	8	outer lid attachment step
10	10, 13	evacuating and blowing head
	11	chamber
	12	degassing plate
	15	pouch
	16	spout
15	18	content
	19	liquid level
	20, 32	filling valve
	21, 33	outer tube
	22	outer rod
20	23	central rod
	25	content supply port
	26	fluid chamber
	27	valve seat
	28	filling nozzle
25	29	valve body
	34	valve rod
	35	discharge port
	36	mesh screen
	37	attachment jig
30	38	mesh nozzle
	40	degassing device
	41	washing and replacement nozzle
	42	degassing plate
	43	cylinder device
35	45	nozzle body
	46	washing water spraying port
	47	gas replacement nozzle
	48	spring
	49	holding plate
40	50	rod portion
	51	flange
	52	engagement protrusion

BEST MODE FOR CARRYING OUT THE INVENTION

45 [0016] An embodiment of the present invention will be described below in greater details with reference to the drawings. In the apparatus for filling and sealing a liquid content in a spouted pouch of an embodiment of the present invention, clamps that are pouch conveying means for conveying a pouch by grasping a spout of the pouch are disposed with a predetermined pitch at the outer peripheral portion of a rotary table that rotates intermittently in the same manner as in
50 the well-known device for filling and sealing spouted pouches of this kind, stations from pouch supply to pouch discharge after filling and sealing are provided along the rotary table, devices for conducting a step that is performed in the stations are disposed in corresponding stations, and by intermittently rotating the rotary table, various steps from the spout supply to the discharge of the filled and sealed spouted pouch products from the rotary table are conducted, the filling to sealing steps being performed therebetween. FIG. 1 is a block diagram illustrating principal steps of a method for filling and
55 sealing a liquid content in a spouted pouch according to an embodiment of the present invention. Because methods similar to the conventional methods can be used for other processes, only the special steps will be described below.

[0017] In the embodiment of the present invention, first, a pre-filling deoxidation step 1 of flatly supplying a spouted pouch and removing the air (oxygen) from the pouch is performed in a pre-filling deoxidation station. In this state, the

pouch has a flat shape in which the front wall and the rear wall thereof almost stick together and the amount of air inside the pouch is small. However, the tests conducted by the inventors to compare a case in which this step is implemented with a case in which the step is not implemented demonstrated a large effect produced by the step on deoxidation ratio after filling and sealing, and providing this step is especially effective in a case of the content that easily deteriorates. A pre-filling first degassing step 1-1 of degassing the pouch, a pre-filling inert gas blowing step 1-2 of blowing an inert gas into the pouch after the pre-filling first degassing step and performing gas replacement, and a gas-reduction vacuum step 1-3 of reducing the amount of inert gas inside the pouch for a predetermined amount from a state in which the pouch has been expanded by the inert gas blown therinto are preferred as the pre-filling deoxidation method, but this method is not limited to the aforementioned processes and may include, for example, only the pre-filling first degassing step or only the pre-filling inert gas blow step.

[0018] A method of sandwiching a pouch body between a pair of degassing plates and squeezing out the gas inside the pouch, similarly to the below-described post-filling degassing step, or any method by which a vacuum suction nozzle is mated with the spout and the inside of the pouch is vacuum degassed may be used as the pre-filling first degassing step, but the preferred method includes, as shown in FIG. 2, evacuating and sucking out the air contained inside the pouch in a state in which an evacuating and blowing head 10 is brought into contact with a top end portion of a spout 16, because such a method ensures complete degassing of the inside of the pouch. The evacuating and blowing head 10 is connected to a pipe having a switchover valve that can be switchably connected to a vacuum pump and an inert gas supply source (in the present embodiment, a nitrogen gas cylinder), and the pre-filling first degassing step 1-1, pre-filling inert gas blowing step 1-2, and gas-reduction vacuum step 1-3, which constitute the pre-filling deoxidation step, can be continuously performed with the same head.

[0019] In the pre-filling inert gas blowing step 1-2 that is performed following the pre-filling first degassing step 1-1, the connection of the evacuating and blowing head 10 is automatically switched to the inert gas supply source, the inside of the pouch that has been degassed in the previous step is filled with a predetermined amount of inert gas, the inside of the pouch assumes a perfect inert gas state, and the combination of this step with degassing of the previous step makes it possible to obtain a state of complete deoxidation inside the spout prior to filling. As for the amount of the inert gas that is filled into the pouch in the pre-filling inert gas blowing step, it is preferred that the inert gas be blown to a full capacity of the pouch, thereby preventing the penetration of external air into the pouch during conveying to the filling step. Nitrogen gas is advantageous as the inert gas, but other inert gases may be also used. The medium to be used is not necessarily a gas, and liquid nitrogen that becomes inert gas upon gasification or fine grains of dry ice can be also used. Therefore, the concept of inert gas in the gas replacement step in accordance with the present invention includes these types of media.

[0020] The gas-reduction vacuum step 1-3 that is then performed in the pre-filling deoxidation station serves to reduce to a predetermined amount the amount of gas inside the pouch that has been expanded by the inert gas to a full capacity in the above-described inert gas blowing step. Thus, the amount of inert gas inside the pouch is reduced to the predetermined amount, as shown schematically in FIG. 2(c) by switching the connection of the evacuating and blowing head 10 again to the vacuum side and discharging a predetermined amount of inert gas from the pouch. The technological idea of this step is described below. As described hereinabove, in the deoxidation step performed prior to filling, from the standpoint of increasing the deoxidation ratio it is desirable that the pouch be conveyed to the next filling station in a state in which the inside of the pouch is filled with as large an amount of inert gas as possible, but in this case the degassing time of the pre-filling second degassing step performed in the filling station increases accordingly and the possibility of increasing the line speed is reduced. Furthermore, it is desirable, as will be described hereinbelow, that in the pre-filling second degassing step the pouch be sandwiched between the degassing plates and degassed at once, but if a large amount of inert gas is present at this time inside the pouch, the amount of gas that is discharged at once increases accordingly. The possible resultant problem is that the ejected inert gas will collide with the distal end of the filling nozzle and scatter in the environment the droplets of content that have adhered to the distal end of the filling nozzle. To prevent this from happening, in the present embodiment, the inert gas is once blown into the pouch to reduce the amount of oxygen inside the pouch to a minimum and then the amount of gas inside the pouch is reduced to an amount that prevents inconveniences such as the reduced possibility of increasing the line speed in the pre-filling deoxidation station and adverse effect on environment. In this case, the discharge of inert gas from the pouch is preferably performed by evacuation rather than with the pressurizing plates, and in the present embodiment, evacuation and gas discharge are performed with the evacuating and blowing head 10.

[0021] However, as shown in the below-described test example, it has been found that where the amount of inert gas inside the pouch is reduced, the corresponding amount of external air can easily penetrate into the pouch as the pouch is conveyed from the pre-filling deoxidation station to the filling station and the concentration of oxygen inside the pouch increases. In order to prevent this from occurring, the conveying path from the pre-filling deoxidation station to the filling station can be formed as a tunnel and filled with an inert gas atmosphere. Such an approach is, however, inconvenient because the equipment becomes complex and a large amount of inert gas is consumed. A comprehensive research has been conducted to resolve this problem. The results obtained demonstrated that the largest amount of the external

gas penetrates into the container after amount reduction at the instant the evacuating and blowing head 10 is separated from the distal end of the spout after inert gas blowing. Therefore, where at least the atmosphere surrounding the spout at the instant the evacuating and blowing head 10 is separated from the spout is the inert gas atmosphere, the penetration of external air before the filling station is reached can be effectively prevented and a high degree of deoxidation can be attained even if the conveying path from the pre-filling deoxidation station to the filling station is not under the inert gas atmosphere. Accordingly, in the present embodiment, as shown in FIG. 2(c), a chamber 11 that blows an appropriate inert gas is disposed so as to obtain an inert gas atmosphere in the vicinity of the contact portion of the spout 16 and the evacuating and blowing head 10 and this vicinity is at all times under the inert gas atmosphere.

[0022] The spouted pouch is conveyed to the filling station in a state in which the pouch is filled, as described hereinabove, with a predetermined amount of inert gas in the pre-filling deoxidation station, a pre-filling second degassing step 2-1 of degassing the inside of the pouch is implemented immediately prior to filling in the filling station and then a content metered amount filling step 2-2 of filling the pouch with the content and a residual liquid discharge step 2-3 of discharging the residual liquid contained inside the filling nozzle are implemented. The pre-filling second degassing step 2-1 is performed to reduce the generation of bubbles during filling and serves to obtain a substantially vacuum state inside the pouch by discharging the gas that has been filled in the pouch from the pouch that has been filled with the inert gas in the previous step. As shown schematically in FIG. 3, the gas is discharged by applying pressure to the pouch 15 with a pair of degassing plates 12. The gas can thus be instantaneously discharged and such a step is advantageous from the standpoint of increasing the line speed. However, the gas can be also discharged by evacuation, as in the previous step.

[0023] In the content metered filling step 2-2, a metered amount of the content is filled in a state in which the filling nozzle is brought into intimate contact with the spout opening in the pouch from which gas has been discharged. In this case, because the inside of the pouch is perfectly closed and in an almost vacuum state, no air flows into the pouch from the outside and no air penetrates into the content that is being filled. As a result, even an easily foamable content can be filled without causing foaming. However, where a perfectly negative pressure is created inside the pouch, the pouch is difficult to expand and filling is made difficult. For this reason, after the filling nozzle has been tightly attached to the pouch, the pouch is expanded by suction performed from the outside by a pair of suction tools with respect to the pouch body, thereby facilitating the filling, increasing the filling speed, and enabling a high-speed filling even with an easily foamable content. After the metered amount has been filled, a residual liquid discharge step 2-3 is performed in which the step is temporarily stopped in a state in which the filling nozzle is tightly attached to the pouch mouth and the residual liquid contained in the nozzle is discharge into the pouch.

Thus, the pouch that has been subjected to the deoxidation step in the previous step is additionally degassed before the pouch is filled with the content and then the filling is performed, thereby making it possible to perform the filling in a state with a lower amount of air inside the pouch and inhibit the occurrence of bubbles more effectively.

[0024] Furthermore, in the conventional method, compressed air is blown into the pouch after filling in order to prevent the residual liquid contained in the nozzle from sagging and lower the liquid level by expanding the pouch, but it has been found that in this case, in particular when the content is easily foamed, the residual liquid contained in the nozzle after filling is blown into the pouch by the compressed air, thereby generating bubbles inside the pouch. In accordance with the present invention, sagging of the residual liquid can be prevented, the occurrence of bubbles can be inhibited, and the deoxidation efficiency can be increased by providing the residual liquid discharge step 2-3 in which the step is temporarily stopped after the filling and the residual liquid remaining in the nozzle mouth is pushed out by a rod, without blowing compressed air after the filling. In a case where a nozzle equipped with a mesh screen is added to the filling nozzle, the liquid sagging can be prevented. Therefore, it is not necessary to discharge forcibly the residual liquid and the residual liquid discharge step 2-3 is not required to be performed after filling the liquid.

[0025] Then, in the present embodiment, a washing and post-filling deoxidation station is provided for performing a post-filling degassing step 3 of pushing out the bubbles that appeared in the head space in this station and discarding the air that penetrated into the head space as the pouch has been transferred from the filling station to the washing and post-filling deoxidation station and a spout washing and post-filling gas replacement step 4 of washing the outer peripheral surface of the spout and performing gas replacement by blowing an inert gas such as nitrogen gas into the pouch. A body of the pouch that has reached the washing and post-filling deoxidation station is compressed by a pair of degassing plates 42 in order to discharge the bubbles contained in the head space from the spout to the outside and perform the degassing inside the head space, and then a washing and replacement nozzle 41 is lowered, washing water is sprayed toward the top surface and outer peripheral portion of the spout, and the inert gas is blown into the pouch, as shown in FIG. 6. In this case, the washing and replacement nozzle 41 completely covers the spout mouth, only the inert gas is blown into the spout, and the washing water does not penetrate into the spout. As a result, the outer peripheral surface of the spout is washed, the adhesion of the content can be prevented, good heat sealing of the inner lid sealing material in the inner lid sealing step that is the last step is ensured, and the outer peripheral surface of the spout after sealing can be cleaned. Furthermore, because the inert gas is blown in the washing step, by contrast with a case where air or nitrogen gas is blown in the filling step, no foaming is caused by the residual liquid and, therefore, no bubbles are

generated inside the pouch, the pouch can be expanded, the level of liquid inside the pouch is lowered, and spilling caused by conveying-induced impacts applied to the content liquid in the subsequent conveying step is prevented. In addition, because the pouch is expanded by the inert gas, rather than air, the deoxidation effect can be dramatically increased. Thus, because a step of expanding the pouch by air or inert gas in the filling step is not provided in the present embodiment, the generation of bubbles can be inhibited even in the case of easily foamable content. Furthermore, because the pouch body is expanded by suction from the outside during filling, the pouch can be expanded to a certain degree even when no compressed air is supplied into the pouch, and one-step conveying to the washing and post-filling deoxidation station, which is adjacent to the filling station, is performed although the decrease in the level of liquid after filling is small. Therefore, spilling of the content caused by impacts during conveying is small, and even if the spilling occurs, it causes no problems because it occurs before the pouch is washed.

[0026] The spout that has been fully expanded by blowing the inert gas thereinto and has a decreased liquid level is then conveyed to a spout drying station where the inert gas is blown onto the inner and outer surfaces of the spout, thereby drying the spout after washing with washing water. Because drying is performed with the inert gas, the inert gas produces an air purging action and prevents the air from flowing from the outside into the pouch. However, in the spout drying station, when the inert gas that is a drying medium is blown onto the spout, the blowing is performed in a state in which the spout opening is completely closed, thereby preventing the drying medium from penetrating into the pouch. Therefore, in this case, compressed air may be also used as the fitting medium. By scattering water that has adhered to the outer peripheral portion of the spout with compressed air, it is possible to perform drying within a short time.

However, in the present embodiment, the amount of oxygen inside the pouch can be dramatically reduced by performing deoxidation in the above-described pre-filling deoxidation step 1 and filling step 2 and the generation of bubbles is also small. Therefore, with the exception of a case where the content that can be foamed extremely easily is used, the spout washing and post-filling first gas replacement step 4 may be omitted and a transition may be directly made from the filling step 2 to a post-filling second gas replacement step 6, as shown by a broken line, in the step diagram shown in FIG. 1.

[0027] The step flow thus advances via the above-described steps to the sealing step, but in the present embodiment, the post-filling second gas replacement step 6 is implemented immediately prior to the inner lid sealing in order to increase further the deoxidation effect. In the post-filling second gas replacement step 6, gas replacement in the head space is performed by blowing the inert gas into the pouch in the post-filling second gas replacement station. Then, the pouch is conveyed to an inner lid preliminary sealing - punching - degassing station and an inner lid sealing step 7 is implemented. In the inner lid sealing step, the pouch body is pressurized by a pair of degassing plates in an inner lid sealing pre-degassing step 7-1 to a degree causing no spilling of the filled liquid, and an inner lid preliminary sealing - punching step 7-2 is implemented to pre-seal and punch the inner lid in this state. The inner lid preliminary sealing - punching step 7-2 is a step in which an inner lid material having heat fusion ability and gas barrier ability, such as a composite sealing material including an aluminum foil and a synthetic resin film, is pre-sealed to the spout and then punched, and a method similar to the conventional method can be used in this process. Then, the inner lid is covered on the entire top surface of spout opening by a first sealing step 7-3 and a second sealing step 7-4, and the pouch is completely sealed with the inner lid. An outer lid is then screwed in an outer lid attachment step 8.

The embodiment of the method for filling and sealing a liquid content in a spouted pouch in accordance with the present invention is described above, but the present invention is not limited to this embodiment and the sequence of steps can be changed or a step can be appropriately omitted or added within a scope in which the object of the invention can be reached.

[0028] FIG. 4 illustrates an embodiment of a filling valve as a filling means disposed in the filling station for performing the above-described function. The filling valve 20 is constituted by an outer tube 21, outer rod 22, and central rod 23. The outer tube 21 is formed in a hollow cylindrical shape and has a content supply port 25 that communicates with a content supply tank via a supply tube 24, a fluid chamber 26, a valve seat 27, and a filling nozzle 28. In the present embodiment, a pair of degassing plates (not shown in the figure) for performing the pre-filling second degassing step are disposed below the filling valve in the filling station. A pair of suction pads for performing suction and opening the pouch body after the step of filling the pouch with the content has been started are also disposed therein. However, in a case where the pre-filling second degassing step is performed by vacuum suction, without using the degassing plates, the supply tube 24 is switchably connected to the vacuum pump and the inside of the pouch is vacuum degassed before supplying the liquid. The outer rod 22 is provided inside the fluid chamber so that the outer rod can be driven and moved up and down by an appropriate actuator such as a cylinder. The outer rod functions as a valve body 29 that is seated on the valve seat 27, thereby opening and closing the filling nozzle 28. The valve body 29 has a through hollow section of approximately the same diameter as the filling nozzle 28 in the central thereof, and the central rod 23 is fitted in the hollow portion so that the central rod can be driven and moved up and down by an appropriate actuator such as a cylinder. The central rod 23 is formed as a solid rod and where the central rod is driven in a state in which the valve body 29 is seated on the valve seat, the distal end portion of the central rod advances inside the filling nozzle 28 and acts to push out the residual liquid remaining inside the filling nozzle into the pouch.

[0029] In the filling station that has disposed therein the filling valve 20 of the above-described configuration, where

the pouch filled with the inert gas in the previous step reaches the filling station, the pre-filling second degassing step 2-1 is implemented by pressurizing the pouch body with a pair of degassing plates, then the filling valve is lowered, and the top portion of the spout 16 of the pouch mates with the filling nozzle 28, as shown in FIG. 4(a). In the content metered filling step 2-2, the valve body 29 rises integrally with the central rod 23, the filling nozzle 28 opens and communicates with the content filling tank via the supply tube, and the content is filled. After the content filling has started, suction of the body is performed with a pair of suction pads and the pouch is expanded as the content is filled. After metered filling, the outer rod 22 and central rod 23 are integrally lowered, as shown in FIG. 4(b), the valve body 29 is seated, the discharge of the content is stopped and then, the central rod 23 is lowered, as shown in FIG. 4(c), and the residual liquid contained in the filling nozzle 28 is pushed out. Therefore, with the present embodiment, the residual liquid contained in the filling nozzle can be discharged into the pouch, without using compressed air. Therefore, liquid sagging after filling is prevented and the generation of bubbles inside the pouch is reduced.

[0030] FIG. 5 shows a filling valve according to another embodiment that serves as a filling means. FIG. 5(a) shows a state in which the valve is open and the content is discharged thereof. FIG. 5(b) shows a state in which the valve is closed. With the filling valve 32 of this embodiment, by contrast with the above-described embodiment, the residual liquid after filling is not pushed out, but a mesh nozzle is provided below the discharge port to prevent the residual liquid from sagging. The filling valve 32 of the present embodiment is constituted by an outer tube 33 having a discharge port 35, a valve rod 34 that closes the discharge port by the lower end portion thereof that serves as a valve body and can seat on a valve seat, and a mesh nozzle 38 that is provided at the lower end of the discharge port 35 of the valve and has a mesh screen 36 in the intermediate section of a discharge path. The reference numeral 37 in the figure denotes an attachment jig for fixing the mesh screen 36 to the mesh nozzle 38. In the present embodiment the mesh screen 36 has three screens that are disposed with a spacing in the discharge path, as shown in the figure, wherein the mesh screen at the lowermost end is formed to have a dome-like shape that protrudes downward, but the number and shape of the screens are not limited to the present embodiment. Since the nozzle is provided with the mesh screen, generation of foaming is reduced by a flow regulation action produced on the content during content filling, and the residual liquid remaining inside the filling nozzle after the metered discharge has been performed remains till the next discharge, without sagging because of the surface tension between the meshes of the mesh screen. Therefore, in this case, the residual liquid is also not required to be discharged by compressed air and sagging and generation of bubbles can be prevented.

[0031] FIG. 6 is a cross-sectional view of a post-filling degassing device 40 and a washing and gas replacement means 41 disposed in the washing and post-filling deoxidation station. In the degassing device 40, a pair of degassing plates 42, 42 that pressurize the body 17 of the pouch 15 are provided so that the spacing between the degassing plates can be regulated by a cylinder device 43. The pouch 15 that has been filled with the content 18 in the filling station is in a somewhat expanded state due to the weight of the content, as shown in FIG. 6(a), a liquid level 19 is lowered, and a large head space is present above the liquid surface. When the pouch that is sandwiched and held between flanges provided at the outer peripheral portion of the spout 16 by a gripping device (not shown in the figure) reaches the washing and post-filling deoxidation station, the body 17 of the spout is positioned between a pair of degassing plates 42, the degassing plates 42 are displaced in this state by a predetermined stroke so as to come closer to each other, and the body 17 of the spout is pressurized to a predetermined degree, thereby raising the liquid level and discharging the bubbles and air contained inside the pouch from the pouch (see FIG. 6(b)). Then, the washing and gas replacement means is lowered, inert gas is sprayed, and the spout mouth is closed with the nozzle. At the same time, the degassing plates 42, 42 of the degassing device 40 return to the original state and the washing and post-filling first gas replacement step is started.

[0032] The washing and gas replacement means 41 is composed of a nozzle body 45 having a washing water spraying port 46, a gas replacement nozzle 47, and a holding plate 49 for holding a spring 48 that biases the gas replacement nozzle 47 downward, wherein the gas replacement nozzle 47 is fitted in the central portion in the axial direction of the nozzle body 45. The gas replacement nozzle 47 has formed therein, as shown in the figure, a flange 51 in the intermediate section of a rod portion 50 that is linked by the base end thereof to the inert gas supply source, and the discharge port at the lower end is formed so as to engage with the spout opening end. In the gas replacement nozzle 47, the flange 51 engages with an engagement protrusion 52 formed in the nozzle body 45, thereby regulating the lower limit position of the gas replacement nozzle and supporting the nozzle body, and the gas replacement nozzle is biased downward by the spring 48 that is fitted between the upper surface of the flange 51 and the holding plate 49. The nozzle body 45 is linked to the washing water supply source via a washing water supply port 53, a plurality of washing water spraying ports 46 that are formed in the direction toward the spout mouth end portion are formed with a predetermined pitch on a circumference of the lower end portion of the nozzle body, and the washing water spraying ports are also formed so that the washing water is sprayed over the entire outer peripheral portion of the spout and the opening end portion and outer peripheral portion of the spout are washed.

[0033] The washing and gas replacement means 41 has the above-described configuration, and when the aforementioned post-filling degassing step ends, the washing and gas replacement means moves down and when the gas replacement nozzle 47 engages with the opening end of the spout 16, the spring cushions the movement, the gas replace-

ment nozzle 47 engages with the spout under a predetermined pressure, the spout mouth portion is sealed, penetration of the washing water into the spout can be reliably prevented, the vibrations or difference in displacement is absorbed, and damage can be prevented. In this state, the spout is washed by spraying the washing water from the washing water spraying ports formed in the nozzle body 45 onto the mouth end portion of the spout and the entire outer peripheral portion thereof. At the same time, the inert gas is sprayed from the gas replacement nozzle 47 and the inside of the pouch is filled with the inert gas. In this case, by contrast with the case in which the air is sprayed by using the filling nozzle, no bubbles are generated inside the pouch, the pouch can be effectively filled with the inert gas, the pouch is expanded to a predetermined degree, as shown in FIG. 6(c), and the liquid level can be lowered. Moreover, because in this case the inside of the head space is filled with the inert gas after degassing, the gas replacement ratio in the head space is high and oxidation of the content can be effectively prevented. Such a step is especially effective in the case where easily oxidizable content is used.

EXAMPLES

[0034] The following test was conducted to confirm the effect of deoxidation attained by providing the pre-filling de-oxidation step.

As shown in Table 1, the test was divided into a test in which of the first degassing step, inert gas blowing step, and degassing step of the pre-filling deoxidation step, only the first degassing step and the inert gas blowing step were implemented, and the degassing step was not performed (No. 1 and No. 2), a test in which the degassing step was performed without a nitrogen atmosphere (No. 3), and a test in which the degassing step was performed under a nitrogen atmosphere (No. 4), the content of air, oxygen concentration, and amount of oxygen were measured after sealing, and the replacement ratio was found. The degassing was carried out for 0.5 sec for all the samples, and nitrogen was blown for 0.03 sec only in No. 1 and for 0.14 sec in other tests. The results are shown in Table 1. Data shown in Table 1 represent the measurement values obtained when the pouch was directly sealed, without filling the content, after the pre-filling deoxidation step.

55 50 45 40 35 30 25 20 15 10 5

Table 1

No.	Time (sec)			Nitrogen atmosphere	Content of air (ml)	Oxygen concentration (%)	Oxygen amount (ml)	Replacement ratio (%)
	Degassing	Nitrogen blowing	Degassing					
1	0.5	0.03	-	-	31	6.7	2.1	68
2	0.5	0.14	-	-	65	1	0.7	95
3	0.5	0.14	0.61	-	23	5.1	1.2	75
4	0.5	0.14	0.61	Yes	27	2.7	0.7	87

[0035] As shown in Table 1, in No. 1 in which nitrogen blowing after degassing was very small and the pouch was sealed as is, the concentration of oxygen was high, the replacement ratio was low, and a sufficient replacement ratio was not obtained. Among other samples, in No. 2 that was directly sealed without degassing after nitrogen blowing, the gas replacement ratio was the highest, but the drawback occurring in this case was that the degassing amount was large and droplets located at the distal end of the filling nozzle were scattered in a case where the pre-filling degassing step involved pushing with the plates. Another drawback encountered when the pre-filling degassing step was implemented by evacuation was that the evacuation could not be performed within the predetermined time. Furthermore, in a case where the degassing was performed without the nitrogen atmosphere (No. 3), the concentration of oxygen increased due to the penetration of the external air in an amount corresponding to the degassing level, and the replacement ratio was lower than in the case of No. 2. However, when the degassing was performed with a nitrogen atmosphere (No. 4), the replacement ratio increased substantially over that of No. 3, and the effect of increasing the replacement ratio by performing the degassing step in the inert gas atmosphere was confirmed.

[0036] In order to confirm the deoxidation effect attained with the method in accordance with the present invention, as shown in Table 2, the content of air, oxygen concentration, and oxygen amount were measured, and the replacement ratio was found with respect to a case in which the steps including the during-filling degassing step, post-filling degassing step, and post-filling second gas replacement step were performed in a case where the pre-filling deoxidation step was carried out by the method shown in No. 4 in Table 1 (Example 2), and a case in which only the post-filling second gas replacement step of these steps was not performed (Example 1). Furthermore, the content of air, oxygen concentration, and oxygen amount were similarly measured, and the replacement ratio was found in comparative examples with respect to a case in which only the post-filling first gas replacement step was performed (Comparative Example 1), a case in which the post-filling degassing step and post-filling first gas replacement step were performed (Comparative Example 2), and a case in which the during-filling degassing step, post-filling degassing step, and post-filling first gas replacement step were performed (Comparative Example 3). The results are shown in Table 2.

[0037]

Table 2									
	Pre-filling deoxidation *3	Pre-filling second deoxidation	Post-filling deoxidation	Post-filling first nitrogen replacement	Post-filling second nitrogen replacement	Content of air (ml)	Oxygen conc. (%)	Oxygen amount (ml)	Replacement ratio (%)
Comparative Example 1	-	-	-	Yes	-	43	8.6	3.7	59
Comparative Example 2	-	-	Yes	Yes	-	42	7	3	67
Comparative Example 3	-	Yes	Yes	Yes	-	38	4.3	1.6	79
Example 1	Yes	Yes	Yes	Yes	-	34	2.8	0.9	86
Example 2	Yes	Yes	Yes	Yes	Yes	32	2.6	0.8	88
*3 The pre-filling deoxidation method is No. 4 in Table 1									

As shown in Table 2, in the examples, that is, when the pre-filling deoxidation was performed, the gas replacement ratio was confirmed to be greatly increased over that in comparative examples.

INDUSTRIAL APPLICABILITY

[0038] The method and apparatus for filling and sealing a liquid content in a spouted pouch in accordance with the present invention can inhibit the occurrence of bubbles and attain a high gas replacement ratio and are, therefore, especially advantageous in a case where a pouch is filled with a content in which bubbles can easily occur and a content that is easily deteriorated by oxidation and subjected to retort sterilization after filling and sealing. However, the method and apparatus are not limited to such cases and can be also used for typical normal-temperature filling, hot packing, and sterilization-free filling. In addition, the content is not limited to liquid foods, and the method and apparatus can be used for filling and sealing various liquid content such as detergents and oils in spouted pouches.

Claims

1. A method for filling and sealing a liquid content in a spouted pouch which is deoxidized, filled with the liquid content and sealed, comprising: a pre-filling deoxidation step of removing air from the spouted pouch prior to content filling; a pre-filling degassing step of degassing the spouted pouch immediately prior to content filling; a filling step of filling the spouted pouch with the liquid content; and a post-filling gas replacement step of blowing an inert gas into the pouch filled with the content and performing gas replacement.
2. The method for filling and sealing a liquid content in a spouted pouch according to claim 1, **characterized in that** the pre-filling deoxidation step comprises a vacuum step of evacuating the air from the pouch, an inert gas blowing step of blowing the inert gas into the pouch after the vacuum step, and a gas-reduction vacuum step of evacuating the gas inside the pouch after the inert gas blow step and reducing the amount of gas inside the pouch to a predetermined amount.
3. The method for filling and sealing a liquid content in a spouted pouch according to claim 2, **characterized in that** the gas-reduction vacuum step is carried out in an inert gas atmosphere by injecting the inert gas in the vicinity of the spout.
4. The method for filling and sealing a liquid content in a spouted pouch according to claim 1, comprising a post-filling degassing step of pressurizing the pouch filled with the content and pressing out the gas and bubbles contained in the pouch, before the post-filling gas replacement step.
5. The method for filling and sealing a liquid content in a spouted pouch according to claim 1, **characterized in that** the filling step includes a residual liquid discharge step of pushing out with a rod a residual liquid that has adhered to a nozzle after the liquid content has been filled and causing the residual liquid to fall down inside the pouch.
6. The method for filling and sealing a liquid content in a spouted pouch according to claim 1, **characterized in that** the pre-filling degassing step includes pressurizing the pouch from outside and degassing the inside of the pouch.
7. The method for filling and sealing a liquid content in a spouted pouch according to claim 1, further comprising a washing step of washing an outer peripheral portion of the spout after the filling step, wherein the washing step and the post-filling gas replacement step are performed simultaneously in the same station.
8. An apparatus for filling and sealing a liquid content in a spouted pouch, comprising: pouch conveying means for conveying a pouch by grasping a spout portion of the pouch; pre-filling deoxidation means for discharging air from the spouted pouch prior to content filling; pre-filling degassing means for discharging gas in the pouch immediately prior to content filling, this means being disposed downstream of the pre-filling deoxidation means; filling means for filling a content into the pouch via the spout; and post-filling gas replacement means for blowing inert gas into the pouch.
9. The apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, **characterized in that** the pre-filling deoxidation means comprises vacuum means for evacuating the air inside the pouch, inert gas blow means for blowing an inert gas into the pouch after the vacuum step, gas-reduction vacuum means for evacuating the gas in the pouch after the inert gas blowing step and reducing the amount of gas inside the pouch to a prede-

terminated amount, and inert gas injection means for supplying the inert gas to the vicinity of a joint portion of the gas-reduction vacuum means and the pouch and obtaining an inert gas atmosphere in the vicinity of the spout.

- 5 10. The apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, further comprising, downstream of the filling means, post-filling degassing means for pressurizing the pouch filled with the content and pushing out the gas and bubbles contained in the pouch.
- 10 11. The apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, further comprising washing and post-filling gas replacement means for washing the spout and also blowing an inert gas into the pouch, and spout drying means for blowing an inert gas or air to dry the spout.
- 15 12. The apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, **characterized in that** the filling means comprises an outer tube having a filling nozzle, an outer rod in which the lower end portion serves as a valve body and closes the filling nozzle by seating on a valve seat, and an inner rod that is slidably fitted into the outer rod, has an outer diameter that enables mating with the filling nozzle, and pushes out a residual liquid contained in the filling nozzle.
- 20 13. The apparatus for filling and sealing a liquid content in a spouted pouch according to claim 8, **characterized in that** the filling means comprises an outer tube having a filling nozzle, a rod in which the lower end portion serves as a valve body and closes the filling nozzle by seating on a valve seat, and a mesh nozzle that is provided at the lower end portion of the filling nozzle and has a mesh screen in a discharge path thereof.
- 25 14. The apparatus for filling and sealing a liquid content in a spouted pouch according to claim 11, **characterized in that** the washing and post-filling gas replacement means comprises a nozzle body that has a washing water spraying port that sprays washing water toward the outer peripheral portion of the spout of the pouch, and a gas replacement nozzle that is positioned in the axial center of the nozzle body, covers an opening end of the spout of the pouch, and injects an inert gas into the spout.
- 30 15. The apparatus for filling and sealing a liquid content in a spouted pouch according to claim 11, **characterized in that** the post-filling degassing means and the washing and post-filling gas replacement means are disposed in the same station, and the degassing means is provided below the washing and post-filling gas replacement means.

Fig. 1

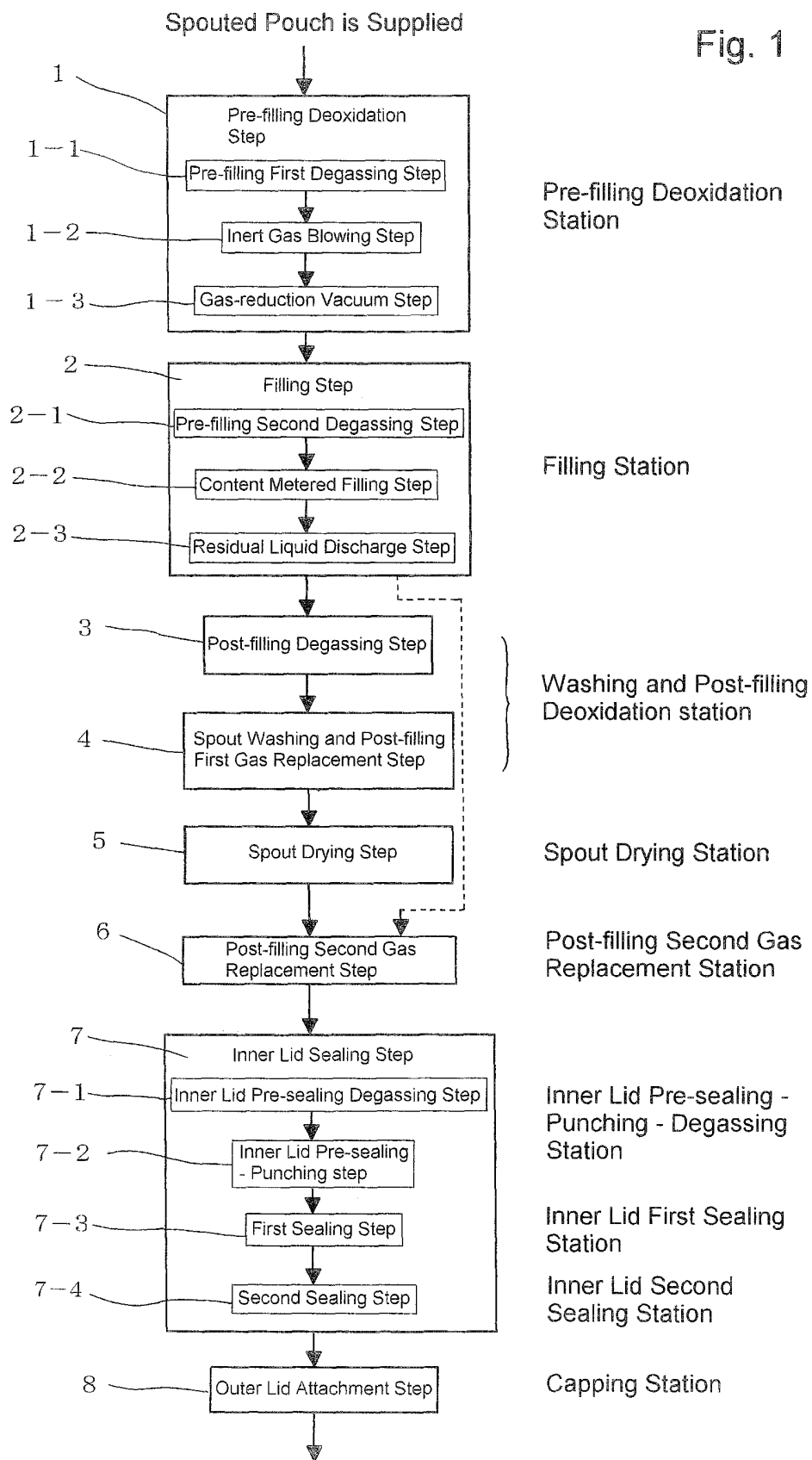
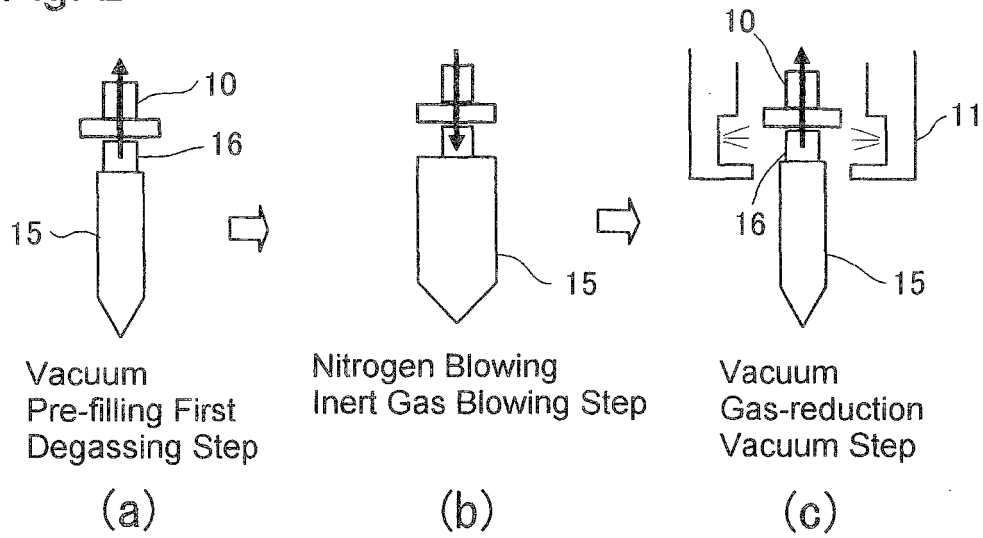
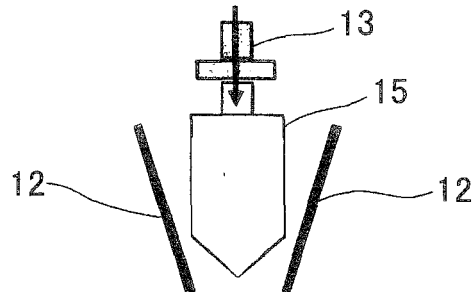


Fig. 2

Pre-filling Deoxidation Step

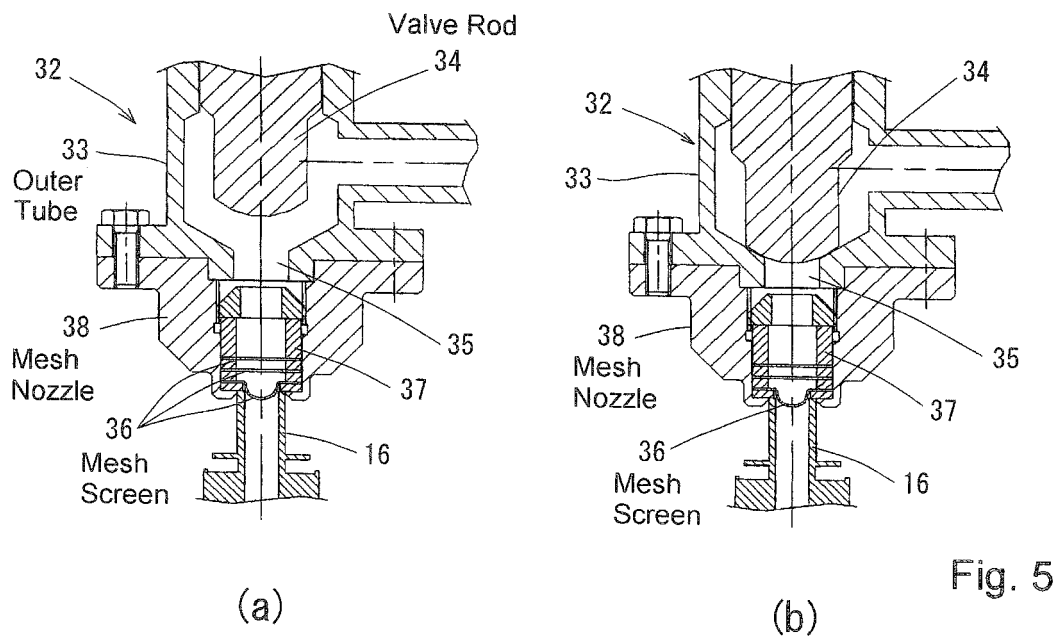
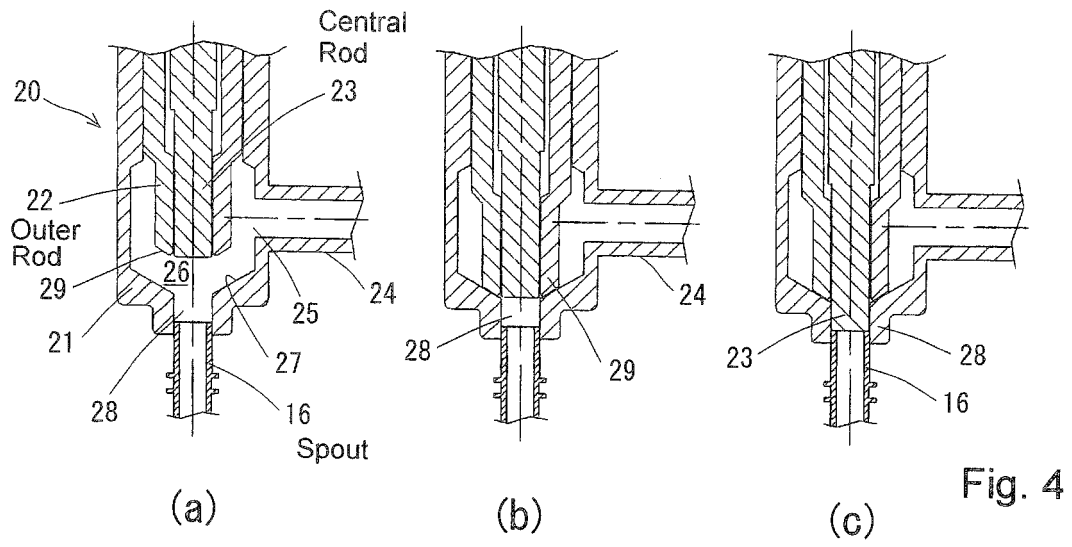


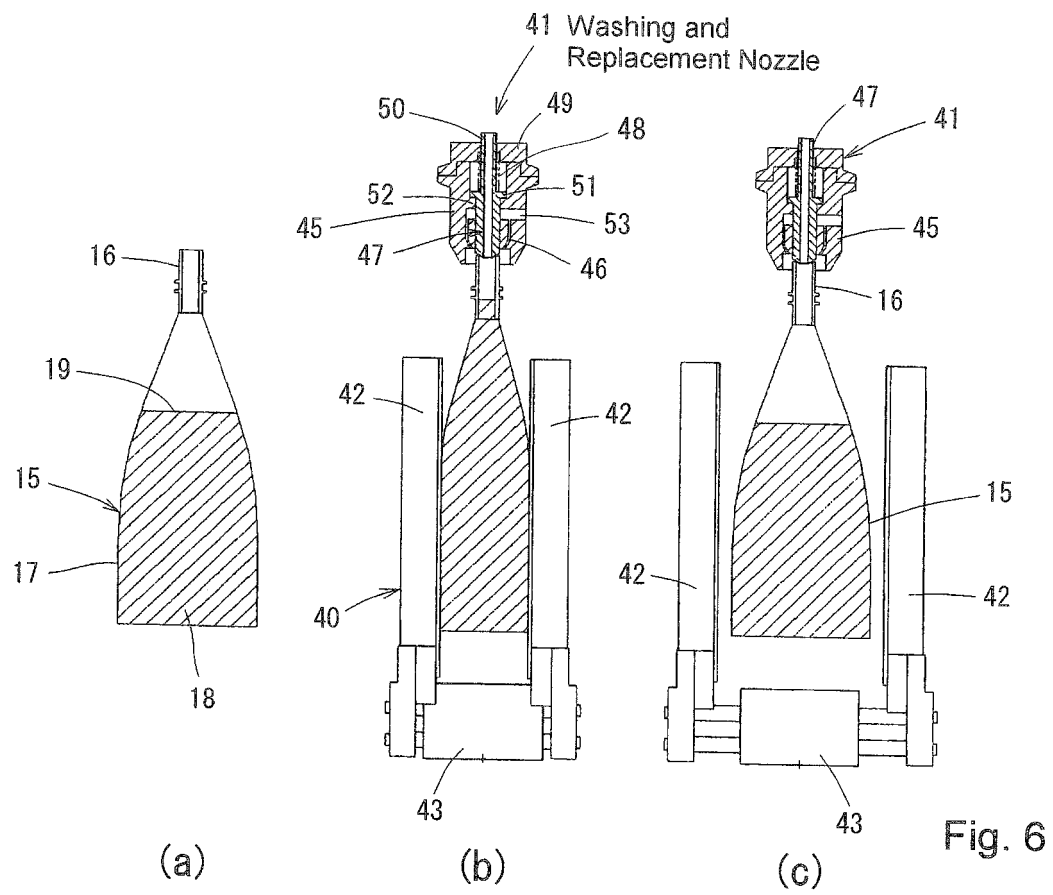
Filling Step



Degassing and Liquid Filling
 Pre-filling Second Degassing
 Step
 Content Metered Filling Step
 Residual Liquid Discharge
 Step

Fig. 3





INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/074515

A. CLASSIFICATION OF SUBJECT MATTER <i>B65B3/22(2006.01) i, B65B3/04(2006.01) i, B65B31/04(2006.01) i, B65B39/00(2006.01) i, B65B55/24(2006.01) i</i> 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) <i>B65B3/22, B65B3/04, B65B31/04, B65B39/00, B65B55/24</i> Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched <i>Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2008</i> <i>Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008</i> Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2006-16010 A (Toyo Seikan Kaisha, Ltd.), 19 January, 2006 (19.01.06), (Family: none)	1-15
A	JP 2001-328601 A (Toyo Jidoki Co., Ltd.), 27 November, 2001 (27.11.01), (Family: none)	1-15
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "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 "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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 06 February, 2008 (06.02.08)		Date of mailing of the international search report 04 March, 2008 (04.03.08)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
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Patent documents cited in the description

- JP 2001328601 A [0004]
- JP 11227724 A [0004]
- JP 2001341708 A [0004]
- JP 2006018205 A [0007]