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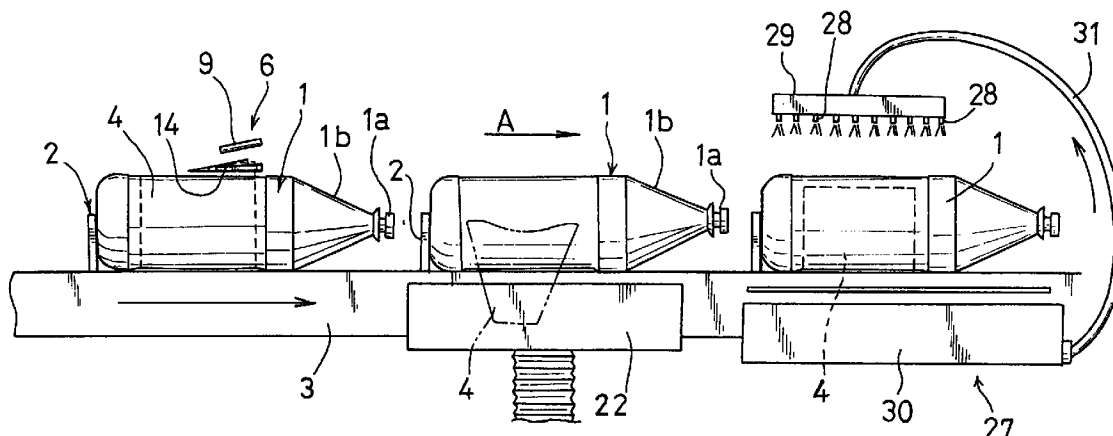
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(54) Method and apparatus for removing a film from a container

(57) The present invention provides a method and apparatus for removing a film from a container. The film (4) having a tubular shape and a self expanding and shrinking property, is first lifted at its one end from the container (1) via a film lifting means. A guiding member

(14) is then interposed between the film (4) and the container (1) from the lifted one end. As the guiding member (14) is moved relative to the container (1) in an axial direction of the container (1), the film (4) is entirely cut from its one end to its opposite end by a cutting means.

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Description

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for removing a tubular film from a container, the film being fitted on a surface of the container.

A container, such as a glass bottle, a polyethylene terephthalate (PET) bottle and other plastic containers usually has a label attached thereon to display a trade mark, ornamental designs or letters, or has a film to protect the container against an impact or the like from outside. A stretch film having a self expanding and shrinking property is widely used for such application.

To recycle the container, it is necessary to renew the film which may be scratched or stained during transportation or actual use of the container. To remove the film from the container, the film is manually cut with a cutter by a worker, which may cause ineffective film removing. In addition, it is difficult to automatically carry out this film removing method.

To solve the above problem, there has been proposed a method for cutting the film by applying a high-pressure water jet between the film and the container, as disclosed in Japanese Patent Kokoku (Publication) No. 60-42115. Further, instead of the high-pressure water jet, a hot blast, and a wire brush has been employed to cut the film.

However, in case the container is made of a relatively soft material, such as polyethylene terephthalate, or other plastic material other than a hard material such as glass, and the film is cut by the high-pressure water jet as described above, the container is likely to be damaged by the water jet. In addition, when the film is made of a shrink film, its tension force can be used to tear the film. However, when the film is made of a stretch film, since the film tends to expand by an outside pressure, it is difficult to tear the film via the pressure of the water jet. The hot blast and the wire brush may also damage the container as in the above cases.

Therefore, it is an object of the present invention to provide a method and apparatus for securely and readily removing a film having a self expanding and shrinking property from a container without causing a damage to the container, even when the container is made of a soft material such as a synthetic resin.

SUMMARY OF THE INVENTION

The present invention provides a method for removing a film from a container. The film having a tubular shape and a self expanding and shrinking property, is first lifted at its one end from the container via a film lifting means. A guiding member is then interposed between the film and the container from the lifted one end. As the guiding member is moved relative to the container in an axial direction of the container, the film is entirely cut from its one end to its opposite end by a cutting means.

The present invention further provides an apparatus for removing a film from a container. The apparatus includes means for lifting the film at one end thereof from the container, the film having a self expanding and shrinking property, and a guiding member for being interposed between the one end of the film and the container. The guiding member is movable relative to the container in an axial direction of the container. The apparatus further includes means for entirely cutting the film from the one end of the film to the opposite end thereof which is previously spaced apart from the container by the guiding member, as the guiding member is moved relative to the container.

In the method of the present invention, when the film is lifted at its one end from the container by the film lifting means, the guiding member is interposed between the film and the container from the lifted one end of the film to space the film away from the guiding member. The cutting means then cuts the film from the one end to the opposite end via the relative movement of the cutting means and the container. A tension force effected by an elastical shrinkage of the film acts on the film in a circumferential direction of the film. As a result, the film is securely and readily cut without damaging the container.

The film lifting means may comprise a nozzle, from which a pressurized fluid is discharged. In this arrangement, the film is lifted at its one end from the container via a pressure of the fluid, forcing against a self shrinkage force of the film. A pressure of the fluid may be set only to such a degree that the film can be lifted apart from the container, but not damaging the container.

Further, when a pair of belt rotating members, each having a belt, are employed for the film lifting means, the belt rotating members gradually move the film towards an axial center of the container via the rotation of the belts to slacken the film between the belts. As a result, the film can be lifted from the container to enable the cutting means to cut the film without damaging the film.

When the apparatus includes means for collecting the film cut by the cutting means, the film is securely removed from the container. Therefore, it is unlikely that the film is left in the proximity of the container, and abstracts a series of the operation including cutting, stripping and collecting of the film. Thus, the film removing operation can be smoothly carried out.

The film collecting means may comprise a plurality of rollers positioned in such a manner as to clamp the film cut by the cutting means, and means for stripping the film from the container by rotating the rollers, as the film is clamped by the rollers. With this arrangement, the film can be securely and readily removed from the container via the rotation of the rollers.

By adjusting the rotational speed of the rollers, the speed of the film stripping operation may be readily adjusted.

The above, and other objects, features and advantages of the present invention will become apparent from the detailed description thereof read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view illustrating an apparatus in accordance with a first embodiment of the present invention.

FIG. 2 is a front view illustrating an essential portion of the apparatus of FIG. 1.

FIG. 3 is a plan view with a partial cross section illustrating an essential portion of the apparatus of FIG. 1.

FIG. 4(a) is a perspective view illustrating a guiding member and a cutter in accordance with the first embodiment.

FIG. 4(b) is a front view with a partial cross section illustrating an operational step, in which a film is spaced at its one end from a container via a pressurized air discharged from the nozzle.

FIG. 4(c) is a front view with a partial cross section illustrating an operational step, in which the film is cut by the cutter.

FIGS. 5(a) to 5(d) are front views illustrating a series of the cutting operation of the film, which are carried out by the cutting mechanism. FIG. 5(a) illustrates the film with its one end lifted from the container. FIG. 5(b) illustrates the guiding member interposed between the film and the container. FIG. 5(c) illustrates the film cut by the cutter. FIG. 5(d) illustrates a state in which the cutting operation is completed.

FIG. 6 illustrates a front view illustrating the apparatus in accordance with a second embodiment of the present invention.

FIG. 7(a) is a plan view illustrating a film lifting means of the apparatus of the FIG. 6.

FIG. 7(b) is a front view with a partial cross section illustrating the film lifting means of FIG. 7(a).

FIG. 8 is a side view illustrating a cutting mechanism of the apparatus of FIG. 6.

FIG. 9 is a schematic front view illustrating a film collecting means of the apparatus of FIG. 6.

FIG. 10 is a schematic plan view illustrating the collecting means of FIG. 9.

FIG. 11 is a front view illustrating the apparatus in accordance with a third embodiment of the present invention.

FIG. 12 is a front view illustrating an essential portion of the apparatus of FIG. 11.

FIG. 13(a) is a plan view illustrating an operational step, in which the container has been transported to the cutting mechanism.

FIG. 13(b) is a plan view illustrating an operational step, in which the container has been transported to a film stripping mechanism.

FIG. 14 is a cross section illustrating an operational step, in which the guiding member is inserted inside of the film. Alternate long and two short dashes lines represent the film which is stripped from the container.

FIG. 15 is a front view illustrating an essential portion of the apparatus in accordance with a fourth embodiment of the present invention.

FIG. 16 is a plan view illustrating the essential portion of the apparatus of FIG. 15.

FIG. 17(a) is a front view with a partial cross section illustrating the film lifting means in accordance with another embodiment of the present invention.

FIG. 17(b) is a side view illustrating the film lifting means of FIG. 17(a).

FIG. 17(c) is a side view illustrating the film lifting means in accordance with a further embodiment of the present invention.

FIG. 18(a) is a side view illustrating the film lifting means in accordance with a still further embodiment of the present invention.

FIG. 18(b) is a front view illustrating the film lifting means of FIG. 18(a).

FIG. 19(a) is a front view illustrating an essential portion of the cutting means in accordance with a further embodiment of the present invention.

FIG. 19(b) is a cross sectional side view illustrating the cutting means of FIG. 19(a).

FIG. 19(c) is a front view illustrating the cutting means in accordance with a still further embodiment of the present invention.

FIG. 20(a) is a perspective view illustrating the guiding member in accordance with another embodiment of the present invention.

FIG. 20(b) is a front view illustrating the guiding member of FIG. 20(a).

FIG. 20(c) is a plan view illustrating the guiding member of FIG. 20(a).

FIG. 21(a) is a side view illustrating the container vertically transported with the apparatus in accordance with another embodiment of the present invention.

FIG. 21(b) is a side view illustrating a state in which the guiding member has been lowered.

FIG. 22 is a front view of the guiding member of FIG. 21(a).

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment

FIGS. 1 to 5 illustrate an apparatus in accordance with a first embodiment of the present invention. A plurality of containers 1 made of a synthetic resin, for example, in the form of a PET bottle respectively have ports 1a, and are horizontally placed on a transporting mechanism 3 such that the ports 1a of the containers 1 are directed towards a downstream side of the apparatus. The transporting mechanism 3 includes a plurality of container fixing jigs 2 with a predetermined space from each other. A plurality of the containers 1 are respectively fixed to the fixing jigs 2, as best shown in FIGS. 2 and 3, and are successively transported by the transporting mechanism 3 in the direction of arrow A.

Tubular films 4, as a label, are fitted over respective surfaces of cylindrical bodies of the containers 1 to display a trade mark, ornamental design and the like there-

eon. The film 4 is made of a polyethylene stretch film having a thickness of about 30 to 100 μm , and has a self expanding and shrinking property. The film 4 thus formed is fitted over the container 1 under tension.

A cutting mechanism 6 includes an air nozzle 9 as a film lifting means, a guiding member 14, and a cutter 21 as a film cutting means. The air nozzle 9 discharges a pressurized air between the container 1 to be transported and an one end 4a of the film 4 which is closer to the port 1a of the container 1. This pressurized air enables the one end 4a to be lifted and spaced apart from the container 1. The nozzle 9 is fixed to a post 12, which is, in turn, fixed to the transporting mechanism 3, such that a nozzle port 10 of the nozzle 9 is inclined downwardly towards the container 1.

A guiding member 14 is made of a synthetic resin, and is positioned below the air nozzle 9. The guiding member 14 is fixed at its base portion to a fixing portion 16 protruding from the post 12 via a pivot 17 in such a manner as to be pivotally movable in the directions of arrows of FIG. 2. The guiding member 14 is positioned such that a tip portion 14a thereof is directed towards the upstream side of the apparatus. The tip portion 14a of the guiding member 14 is bent downwardly, and a spherical portion 15 is integrally formed at the tip portion 14a. The air nozzle 9 and the guiding member 14 are positioned above the container 1 and along an axial center of the container 1.

A spring 20 is provided between the fixing portion 16 and the base portion of the guiding member 14 such that the spherical portion 15 of the guiding member 14 is usually urged towards the surface of the container 1 via a spring force of the spring 20, and abuts against the same. An upper edge of the tip portion 14a of the guiding member 14 becomes gradually higher towards the base portion of the guiding member 14. The cutter 21 of a triangular shape is provided at a rear portion of the tip portion 14a of the guiding member 14 in such a manner as to become higher towards the base portion of the guiding member 14. A cutting edge 21a along an uppermost edge of the cutter 21 has substantially the same slanting angle as that of the tip portion 14a of the guiding member 14.

A vacuum mechanism 22 is positioned downstream of the cutting mechanism 6 and on either side of the longitudinal path of the transporting mechanism 3 in such a manner as to suck and collect the film 4 cut by the cutter 21, as illustrated in FIG. 1. A fluid discharging mechanism 24 is positioned downstream of the vacuum mechanism 22, and includes a fluid discharging member 29 carrying a plurality of exhaust nozzles 28 and positioned above the container 1, and a tank 30 in which a pressurized water to be discharged from the exhaust nozzles 28 is stored, which water is supplied to the fluid discharging member 29 via a pipe 31. With this fluid discharging mechanism 24, the film 4, which has not been collected by the vacuum mechanism 22 and still remains on the container 1, can be collected by discharging a mixture of air and water to the film 4. This fluid discharging mechanism 24 and the vacuum mechanism 22 make up a film collecting means.

anism 24 and the vacuum mechanism 22 make up a film collecting means.

In operation of the apparatus of this arrangement, a plurality of the containers 1 are first fitted to the respective container fixing jigs 2 such that the ports 1a of the containers 1 are directed towards the upstream side in a transporting direction A of the container 1. As the containers 1 are transported by the transporting mechanism 3, the air nozzle 9 discharges the pressurized air towards each container 1 such that the pressurized air is intruded between the container 1 and the one end 4a of the film 4 to lift and space the one end 4a from the container 1, as illustrated in FIG. 5(a). Accordingly, the film 4 can be securely and readily lifted from the container 1 by the pressurized air via the self expanding and shrinking property of the film 4.

The spherical portion 15 of the guiding member 14 abuts against a tapered shoulder portion 1b of the container 1, and during the transportation of the container 1, the spring 20 urges the guiding member 14 downwardly such that the spherical portion 15 of the guiding member 14 slides along a surface of the shoulder portion 1b of the container 1, and the tip portion 14a of the guiding member 14 is intruded between the film 4 and the container 1, as illustrated in FIGS. 4(b) and 5.

The container 1 are then transported to the next station, in which the film 4 is spaced apart from the container 1 by the tip portion 14a of the container 14, forcing against the elastic shrinkage force of the film 4, and the film 4 subsequently slides along the tip portion 14a of the guiding member 14 via the relative movement of the guiding member 14 and the container 1. As the guiding member 14 guides the film 4 to the cutter 21, the cutter 21 entirely cuts the film 4 from the one end 4a of the film 4 to the opposite end thereof, since the cutter 21 is moved together with the guiding member 14, as illustrated in FIGS. 4(c), 5(c) and 5(d).

In the cutting operation of the film 4, the pressure of the discharged air from the air nozzle 9 is controlled only to such a degree to lift the film 4 from the container 1. Therefore, it is unlikely that the pressurized air damages the container 1 made of the synthetic resin. In addition, since the tip portion 14a of the guiding member 14 slides at its spherical portion 15 along the surface of the container 1, the tip portion 14a can be securely interposed between the container 1 and the film 4, while preventing the spherical portion 15 from damaging the surface of the container 1.

The film 4 cut by the cutter 21 is then sucked by the vacuum mechanism 22 and is collected at a predetermined position. Even if contents of the container 1 such as a liquid and the like happen to be intruded between the container 1 and the film 4, causing the film 1 to stick to the container 1, and the vacuum mechanism 22 could not suck the film 4 because of such stickiness, the film 4 can be securely stripped from the container 1 by discharging the pressurized air and water from the fluid discharging member 29 to the film 4, as the container 1 passes through the fluid discharging mechanism 24. The

containers 1 with the film 4 stripped therefrom are transported to the next process and are collected at a predetermined position.

In this embodiment, to completely remove the film 4 from the container 1, the vacuum mechanism 22 and the fluid discharging mechanism 24 are employed as the film collecting means. However, it is possible to employ either one mechanism, and position the fluid discharging mechanism 24 upstream of the vacuum mechanism 22.

Second Embodiment

FIGS. 6 to 10 illustrate the apparatus in accordance with a second embodiment of the present invention. One or more nozzles 46 are positioned above the container 1 for discharging a pressurized cold or hot water between the film 4 and the container 1. With this arrangement, even if the contents such as a juice drink is intruded and is consequently dried between the container 1 and the film 4, causing the film 4 to stick to the container 1, it is possible to weaken the sticking force of the film 4 by the discharged water.

A pair of belt rotating members 47 are disposed downstream of the nozzle 46, and each belt rotating member 47 includes a pair of pulleys 49a and 49b positioned along the transporting direction A of the container 1, and an endless rubber belt 50 with a plurality of transverse protrusions 50b thereon wound around the pulleys 49a and 49b. The belt rotating members 47 gradually become closer to each other towards the downstream side of the transporting mechanism 3, as illustrated in FIG. 7(a), and the belt rotating members 47 are inclined such that imaginary vertical axes of the belt rotating members 47, which come across rotational axes of the belt rotating members 47 at right angles, are directed substantially towards an axial center of the container 1, as illustrated in FIG. 8. Rotating shafts 52 of the pulleys 49a positioned on an upstream side of the belt rotating members 47 are connected together via a universal coupling 53, enabling both belts 50 to be moved in association with each other. The endless rubber belts 50 are rotated in such a direction that a film contacting portion 50a of each belt 50 is moved in the same direction as the transporting direction A of the container 1. It is preferable that the rotational speed of the endless rubber belts 50 is set substantially at the same speed as the transporting speed of the container 1.

The guiding member 14 has substantially a semi-cylindrical body for covering an outer periphery of the container 1, a lower end of which being open to outside. The tip portion 14a extends from the semi-cylindrical body between the opposite pulleys 49b at a downstream end portion of the endless rubber belts 50, and is provided with the cutter 21 of a triangular shape. This arrangement enables the tip portion 14a to be readily inserted into the space between the film 4 and the container 1, and enables the cutter 21 to subsequently and securely cut the film 4. After this cutting operation of the film 4, the guiding member 14 advances between the film

4 and the container 1 such that any fragments of the film 4 stuck to the surface of the container 1 can be forcibly stripped and removed from the container 1 along an outer surface of the guiding member 14. In this arrangement, the nozzle 9 is also arranged above the cutter 21 as in the first embodiment.

As illustrated in FIGS. 9 and 10, a film stripping belt member 55 as a means for stripping the film 4 is disposed on either side of the longitudinal path of the transporting mechanism 3, and an air nozzle 56 is positioned on the side opposite to the stripping belt member 55 with the transporting mechanism 3 therebetween to apply an air pressure to the container 1, thereby moving a fragment 4b of the film 4 towards the stripping belt member 55.

The stripping belt member 55 and the air nozzle make up a means for collecting the film 4. The stripping belt member 55 includes a pair of upper and lower endless belt members 58 and 59 which are respectively supported by a plurality of pulleys 54 in such a manner as to be circulated, and which are gradually and downwardly inclined downstream of the transporting mechanism 3. The lower belt member 59 includes a film receiving portion 58a which horizontally extends from a slanting portion thereof towards the upstream side of the transporting mechanism 3, and an upper surface of the lower belt member 59 are positioned substantially at the same height as the axial center of the container 1 to receive the fragment 4b of the film 4 thereon.

A collecting bucket 60 is disposed below the downstream side of the upper and lower belt members 58 and 59 to collect the film 4 stripped by the belt members 58 and 59.

Operational steps of the apparatus in accordance with the second embodiment will be described hereinbelow.

The containers 1 are successively transported in the same manner as that of the first embodiment, and are subsequently subjected to the cooling or hot water discharged from the nozzle 46 under a predetermined pressure. This water is introduced between the container 1 and the film 4 to enable the film 4 to be readily released from the container 1, even if the film 4 sticks to the container 1 via the dried contents of the container 1 therebetween.

The belt rotating members 47 press the film 4 and gradually move the film 4 towards a longitudinal center of the container 1 in such a manner as to lift the film 4 from the container. A period of time for the processes from the water discharging to the film lifting via the belt rotating members 47 may be varied to allow the discharged water to intrude between the film 4 and the container 1 to weaken the sticking force of the film 4 to the container 1.

As the container 1 is transported downstream, the pressurized air is applied to the film 4 which has been lifted by the belt rotating members 47 to keep the film 4 in a spaced relationship with the container 1. The tip portion 14a of the guiding member 14 is interposed between the container 1 and the film 4, and then the cutter 21 cuts

the film 4 entirely from the one end 4a of the film 4 to the opposite end thereof. In this step, it is not necessary to dispose the air nozzle 9 in the apparatus, provided that the belt rotating members 47 can solely lift the film 4.

The flagment 4b of the film 4 is then bent and moved onto the receiving portion 58a of the stripping belt 55, and is transported in this state together with the container 1. The flagment 4b is then clamped by the upper and lower belt members 58 and 59, and is forcibly pulled downward by the belt members 58 and 59 in cooperation with the movement of the container 1. The film 1 is thus removed from the container 1 and falls into the collecting bucket 60 for a further treatment.

Third Embodiment

FIGS. 11 to 16 illustrate the apparatus in accordance with a third embodiment of the present invention. The container 1, in the form of the PET bottle or the like is provided on its surface with the tubular film 4 as in the first and second embodiments. The containers 1 are horizontally placed on the transporting mechanism 3 such that the ports 1a are directed downstream of the transporting mechanism 3. The container 1 are fitted to the respective container fixing jigs 2 and are successively transported in the direction of arrow A in a fixed state. The cutting mechanism 6 has the same arrangement as in the second embodiment. That is, it includes a pair of the belt rotating members 47 and the air nozzle 9 as the film lifting means, and the cutter 21 as the cutting means.

The belt rotating members 47 also have the same arrangement as in the second embodiment. That is, each member 47 includes a pair of the pulleys 49a and 49b, and the endless rubber belt 50 with a plurality of the transverse protrusions 50b thereon wound around the pulleys 49a and 49b. The guiding member 14 has the semi-cylindrical body, extends at its tip portion 14a between the pulleys 49b at a downstream end portion of the endless belt members 50, and is provided at its tip portion 14a with the cutter 21 of a triangular shape, as in the second embodiment.

The nozzle 46 is also provided in such a manner as to discharge the pressurized cold or hot water between the film 4 and the container 1, as in the second embodiment.

A film removing mechanism 25 includes rubber mounted upper and lower rollers 26 and 27, and is disposed downstream of the cutting mechanism 6 and on either side of the longitudinal path of the transporting mechanism 3 to remove the film 4, which has been stripped from the container 1, by clamping the film 4. An abutment between the upper roller 26 and the lower roller 27 is positioned substantially at the same height as the axial center of the container 1. In this embodiment, the lower roller 27 includes a pair of rollers 27a and 27b disposed in a parallel relationship with the transporting mechanism 3, as illustrated in FIGS. 13(a), 13(b) and 14.

The lower roller 27a is positioned adjacent the transporting mechanism 3 and is connected to a motor 40 via

a belt 41. Another lower roller 27b is positioned outside of the roller 27, and is associated therewith via the upper roller 26. With this arrangement, the rotational force from the motor 40 is transmitted to the roller 27a to cause the roller 27a to be rotated in the direction of arrow B. The upper roller 26 and the lower roller 27b are subsequently rotated in the directions indicated by arrows of FIG. 14.

The lower rollers 27a and 27b extend from the upper roller 26 to form a film guiding portion 28 with their upper surfaces to guide the film 4 towards the abutment between the upper and lower rollers 26 and 27, as illustrated in FIGS. 12 and 13. An air nozzle 56, as a film removing means, is disposed on the opposite side to the film removing mechanism 25 with the transporting mechanism 3 therebetween to discharge the pressurized air towards the film 4 to remove the film 4 from the container 1. The collecting bucket 60 is disposed below the downstream side of the film removing mechanism 25 to collect the film 4 stripped by the film removing mechanism 25. The bucket 60, the film removing mechanism 25 and the air nozzle 56 make up a film collecting means.

In operation of the apparatus in accordance with the third embodiment, the containers 1 are horizontally placed on the transporting mechanism 3 such that the ports 1a are directed downstream of the apparatus, and are fixed to the respective container fixing jigs 2. The containers 1 are successively transported by the transporting mechanism 3 in a fixed state, and are subjected to the water treatment, in which the pressurized water is discharged towards the container 1 from the nozzle 46 to thereby remove the contents of the container 1 which happened to intrude between the film 4 and the container 1. The sticking force of the film 4 is thus weakened.

The containers 1 are then transported by the transporting mechanism 3 to the cutting mechanism 6, in which the belt rotating members 47 presses and gradually move the film 4 towards the longitudinal center of the container 1 in such a manner as to lift the film 4 from the container 1, as illustrated in FIG. 14. At the same time of lifting the film 4, the air nozzle 9 discharges the pressurized air to the film 4 to keep the film 4 in a spaced relationship with the container 1.

As the film 4 is transported downstream in a fixed state on the transporting mechanism 3, the tip portion 14a of the guiding member 14 is interposed between the film 4 and the container 1 from the lifted end of the film 4, and the cutter 21 subsequently cuts the film 4 as in the second embodiment. After cutting the film 4, any fragments of the film 4 left on the container 1 can be forcibly removed from the container 1 by interposing the guiding member 14 between the film 4 and the container 1. The film 4 is then cut up, and edges of the film 4 are forced sideways. The flagment 4b of the film 4 is thus placed on the film guiding portion 28 of the film removing mechanism 25.

Referring to FIG. 13(b), the air nozzle 56 discharges the pressurized air to the container 1 from the side opposite to the film removing mechanism 25 with the transporting mechanism 3 therebetween such that the

fragment 4b of the film 4 is blown towards the guiding portion 28 of the film removing mechanism 25, even if the film 4 is left on the container 1, after the film stripping operation has been done by the guiding member 14.

The film 4 is moved in the transporting direction of the container 1 together with the container 1. The film 4 is guided to the abutment of the upper and lower rollers 26, 27a and 27b. The film 4 is then clamped by these rollers and completely removed from the container 1 by the rotation of the rollers, as indicated by two-dot long and two short dashes lines of FIG. 14. The film 4 removed from the container 1 is then collected by the collecting bucket 60 disposed below the film removing mechanism 25.

Fourth Embodiment

FIGS. 15 and 16 illustrate a fourth embodiment of the present invention. As in the first embodiment, the apparatus includes the cutting mechanism 6 for cutting the film 4, the air nozzle 9 and the guiding member 14 as the film lifting means, and the cutter 21 as the cutting means. The air nozzle 9 is fixed to the post 12 which, in turn, is fixed to the transporting mechanism 3 such that the nozzle port 10 of the air nozzle 9 is downwardly inclined, as illustrated in FIG. 15. The guiding member 14 has the same arrangement of that of the first embodiment. That is, the guiding member 14 is positioned such that the tip portion 14a thereof is directed towards the upstream side of the apparatus. The tip portion 14a of the guiding member 14 is bent downwardly, and the spherical portion 15 is integrally formed at the tip portion 14a. The guiding member 14 is urged downward by the spring 20 such that the spherical portion 15 abuts the surface of the container 1.

The film removing mechanism 25 has the upper and lower rollers 26 and 27, as disclosed in the third embodiment, and is disposed slightly downstream of the cutting mechanism 6 and on either side of the longitudinal path of the transporting mechanism 3. A vacuum mechanism 57 is disposed below the film removing mechanism 25 such that the film 4 fed from the film removing mechanism 25 is sucked and forwarded to the collecting bucket 60. The air nozzle 56 is disposed on the opposite side of the transporting mechanism 3 to the film removing mechanism 25, as in the third embodiment. The air nozzle 56 discharges the pressurized air towards the film 4 to strip the same which has been cut by the cutting mechanism 6, as illustrated in FIG. 16.

The film removing operation will be carried out in the same manner as the above embodiments. That is, the containers 1 are fixed to the respective container fixing jigs 2 such that the ports 1a are directed downstream of the transporting mechanism 3. The containers 1 are then transported to the cutting mechanism 6, in which the air nozzle 9 discharges the pressurized air between the container 1 and the film 4 to lift the one end 4a of the film 4, as illustrated in FIG. 4(b), and the tip portion 14a of the

guiding member 14 is inserted between the lifted end portion 4a of the film 4 and the container 1.

The containers 1 are further transported by the transporting mechanism 3 such that the relative movement of the cutter 21 and the container 1 enables the film 4 to slide along the tip portion 14a of the guiding member 14. The guiding member 14 then guides the film 4 to the cutter 21 such that the film 4 is entirely cut from the one end 4a of the film 4 to the opposite end thereof.

The one end 4b of the film 4, which has been cut by the cutter 21, is moved onto the guiding portion 28 of the film removing mechanism 25 by the pressurized air discharged from the air nozzle 56 positioned on the opposite side of the transporting mechanism 3. The film 4 is then clamped and removed from the container 1 by the upper and lower rollers 26 and 27. The film 4, which has been moved out of the transporting mechanism 3, is sucked and forwarded to the collecting bucket 60 by the vacuum mechanism 57. In this arrangement, it is not necessary to dispose the vacuum mechanism 57 in the apparatus of this embodiment.

Other Embodiments

In the above embodiments, the lower rollers 27 of the film removing mechanism 25 is formed of a pair of the lower rollers 27, but the lower roller 27 may be formed by one lower roller. In addition, it is not essential to form the guiding portion 28 by the extension of the lower rollers 27a and 27b, in which the extension extends upstream of the transporting mechanism 3. However, the guiding portion 28 facilitates the guiding of the film 4 via the rotation thereof to the abutment of the upper and lower rollers 26 and 26.

As illustrated in FIGS. 17(a) and 17(b), the film lifting means may be formed of a roller 63 with a rubber ring 62 thereon, which is rotatably positioned above the longitudinal center of the container 1, in which a rotational axis of the roller 63 extends in a direction transverse to the transporting direction A of the container 1. The roller 63 is rotated in the reverse direction to the transporting direction A of the container 1, as indicated by the arrow of FIG. 17(a), such that the rubber ring 62 lifts the one end 4a of the film 4 via friction between the rubber ring 62 and the film 4, when pressing the end 4a of the film 4.

The film lifting means may be formed of a pair of rollers 63 which are disposed above the container 1 at positions corresponding to both sides of the container with the longitudinal center of the container 1 therebetween, as illustrated in FIG. 17(c).

Further, the film lifting means may be formed of a pair of clamping arms 65, both upper ends of which are pivotally connected together via a pivot 66, as illustrated in FIGS. 18(a) and 18(b). The clamping arms 65 are driven by a cylinder or an electric motor (not shown) to clamp and lift the film 4 from the container 1.

Further, the guiding member 14 is provided along its longitudinal axis with an upwardly facing longitudinal groove 35, and a rotary cutter 36 is pivotally fixed to a

stay 37 such that a lower portion of the rotary cutter 36 is inserted into and moved along the groove 35, as illustrated in FIGS. 19(a) and 19(b). With this arrangement, the film 4 is cut by the rotary cutter 36, as the rotary cutter 36 is rotated via the relative movement of the film 4 and the guiding member 14. However, the rotary cutter 36 may be driven by a conventional driving means such as a motor.

Further, a laser radiating mechanism 39, as the film cutting means, may be disposed above the guiding member 14, as illustrated in FIG. 19(c). With this arrangement, the film 4 can be cut by a laser radiated from the laser radiating mechanism 39 without damaging the container 1. In this arrangement, a control unit may be provided to control the air nozzle 9 and the laser radiating mechanism 39 in such a manner as to stop the air discharging by the the air nozzle 9 at the time of the laser radiation by the laser radiating mechanism 39, or vice versa.

The guiding member 14 may be varied in shape, as illustrated in FIGS. 20(a), 20(b) and 20(c). The guiding member 14 has a cylindrical body, an open end 41, into which the container 1 is insertable, and the tip portion 14a protruding from the cylindrical body 14. The cutter 21 of a triangular shape is disposed at the tip portion 14a. A pusher 44 is provided in such a manner as to push a container bottom 1c. With this arrangement, the pusher 44 first pushes the container 1, as the air nozzle 9 discharges the pressurized air to lift the film 4 from the container 1. The tip portion 14a of the guiding member 14 is then interposed between the film 4 and the container 1 to enable the cutter 21 to cut the film 4 from the lifted portion of the film 4. Since the guiding member 14 is interposed between the container 1 and an entire area of the film 4, the film 4 can be forcibly and securely removed from the container 1. This arrangement can omit the vacuum mechanism 22 and the fluid discharging mechanism 24.

In the above embodiments, the guiding member 14 abuts and slides along the container 1. However, the guiding member 14 may be spaced apart therefrom. This arrangement also enables the film 4 to be stripped from the container 1 via the relative movement of the container 1 and the cutting mechanism 6.

The relative movement of the container 1 and the cutting mechanism 6 may be made by moving the cutting mechanism 6 only, while fixing the container 1 in position, or vice versa. Instead, both container 1 and cutting mechanism 6 may be simultaneously moved.

Further, the container 1 may be vertically placed during the film removing operation, as illustrated in FIGS. 21(a), 21(b) and 21(c). In this arrangement, the cutting mechanism 6 is vertically moved along the surface of the container 1. The cutting mechanism 6 includes a semi-cylindrical guiding member 14, the air nozzle 9 and a pair of belt rotating members 61. Each of the belt rotating members 61 includes a pair of roller members 62 mounted to a side of the guiding member 14 and rotatable about rotational axes 62a thereof, and two rotating

belts 63 wound around the roller members 62. The belt rotating members 61 is thus movable together with the guiding member 14. The air nozzle 9 is provided in such a manner as to discharge the pressurized air from an upper portion of the container 1 to the lower portion thereof.

The film 4 is released from the container 4 via the pressurized air from the nozzle 9, and the guiding member 14 is inserted between the film 4 and the container 1. The rotating belts 63 presses the film 4 towards the container 1 to prevent the film 4 from moving when the pressurized air is applied thereto to ensure the cutting operation of the film 4. The roller members 62 then are rotated about the rotational axes 62a along the film 4 by the downward movement of the guiding member 14.

In this arrangement, since the container 1 is vertically placed, the film 4 is likely to slip downwardly via the downwardly applied pressurized air from the nozzle 9, which may hesitate the smooth cutting of the film 4. However, the rotating belts 63 secure the cutting operation by pressing the film 4 towards the container 1.

Further, it is not essential to limit the shape of the container 1 to the above embodiments. In addition, it is not necessary to limit the fluid for removing the film 4 from the container 1 to air. Other gasses, or liquid such as water may be discharged from the nozzle.

This specification is by no means intended to restrict the present invention to the preferred embodiments set forth therein. Various modifications to the the method and apparatus for removing the film from the container of the present invention, as described herein, may be made by those skilled in the art without departing from the spirit and scope of the present invention as defined in the appended claims.

Claims

1. A method for removing a tubular film (4) from a container (1) which comprises the steps of;
 - lifting said film (4) at one end thereof from said container (1) via a film lifting means, said film (4) having a self expanding and shrinking property;
 - interposing a guiding member (14) between the film (4) and the container (1) from said lifted one end of the film (4);
 - moving said guiding member (14) relative to the container (1) in an axial direction of the container (1) in such a manner as to space the film (4) from the container (1); and
 - cutting the film (4) entirely from said one end to the opposite end of the film (4) by a cutting means via the relative movement of the guiding member (14) and the container (1).
2. A method as set forth in claim 1, wherein said film lifting means is a means for discharging a pressurized fluid between said container (1) and said one end of the film (4).

3. A method as set forth in any one of claims 1 and 2, comprising the additional steps of:
 clamping said film (4), which has been cut by said cutting means, by a plurality of rollers (26, 27); and
 removing said film (4) from said container (1) by rotating said rollers (26, 27). 5

4. An apparatus for removing a tubular film (4) from a container (1) comprising: 10
 means for lifting the film (4) at one end thereof from the container (1), said film (4) having a self expanding and shrinking property;
 a guiding member (14) for being interposed between the film (4) and the container (1) from said lifted one end of the film (4), said guiding member (14) movable relative to the container (1) along an axial direction of the container (1) in such a manner as to space the film (4) from the container (1); and 15
 means for cutting the film (4) entirely from said one end of the film (4) to the opposite end thereof via the relative movement of the guiding member (14) and the container (1). 20

5. An apparatus as set forth in claim 4, further comprising means for collecting the film (4) cut from the container (1). 25

6. An apparatus as set forth in claim 5, wherein said film collecting means comprises a plurality of rollers (26, 27) positioned in such a manner as to clamp the film (4) cut by the cutting means, and means for removing the film (4), which is clamped by said rollers (26, 27), from the container (1) by rotating the rollers (26, 27). 30
35

7. An apparatus as set forth in claim 5, wherein said film collecting means comprises a film stripping belt member (55) positioned in such a manner as to receive the film (4) cut by the cutting means thereon and remove the film (4) from the container (1) by transporting the film (4) along said film stripping belt member (55). 40

8. An apparatus as set forth in claim 4, wherein said film lifting means comprises a nozzle (9) for discharging a pressurized fluid between said container (1) and said film (4). 45

9. An apparatus as set forth in claim 4, wherein said film lifting means comprises a pair of belt rotating members (47, 47) positioned in such a manner as to become closer to one another towards a downstream side in a transporting direction of the container (1), said belt rotating members (47, 47) respectively having belts (50, 50) which are rotatable, while pressing the film (4). 50
55

10. An apparatus as set forth in claim 4, wherein said film lifting means comprises a nozzle (9) for discharging a pressurized fluid between the container (1) and the film (4), and a pair of belt rotating members (47, 47) positioned in such a manner as to become closer to one another towards a downstream side in a transporting direction of the container (1), said belt rotating members (47, 47) respectively having belts (50, 50) which are rotatable, while pressing the film (4).

11. An apparatus as set forth in claim 4, wherein said cutting means comprises a cutter (21) positioned on an upper surface of the guiding member (14).

12. An apparatus as set forth in claim 4, wherein said cutting means comprises a rotary cutter (36), a part of which being insertable into a groove (35) provided in an upper surface of the guiding member (14).

13. An apparatus as set forth in claim 4, wherein said cutting means comprises a laser radiating means (39) positioned above the guiding member (14) for radiating laser towards the film (4).

FIG. 1

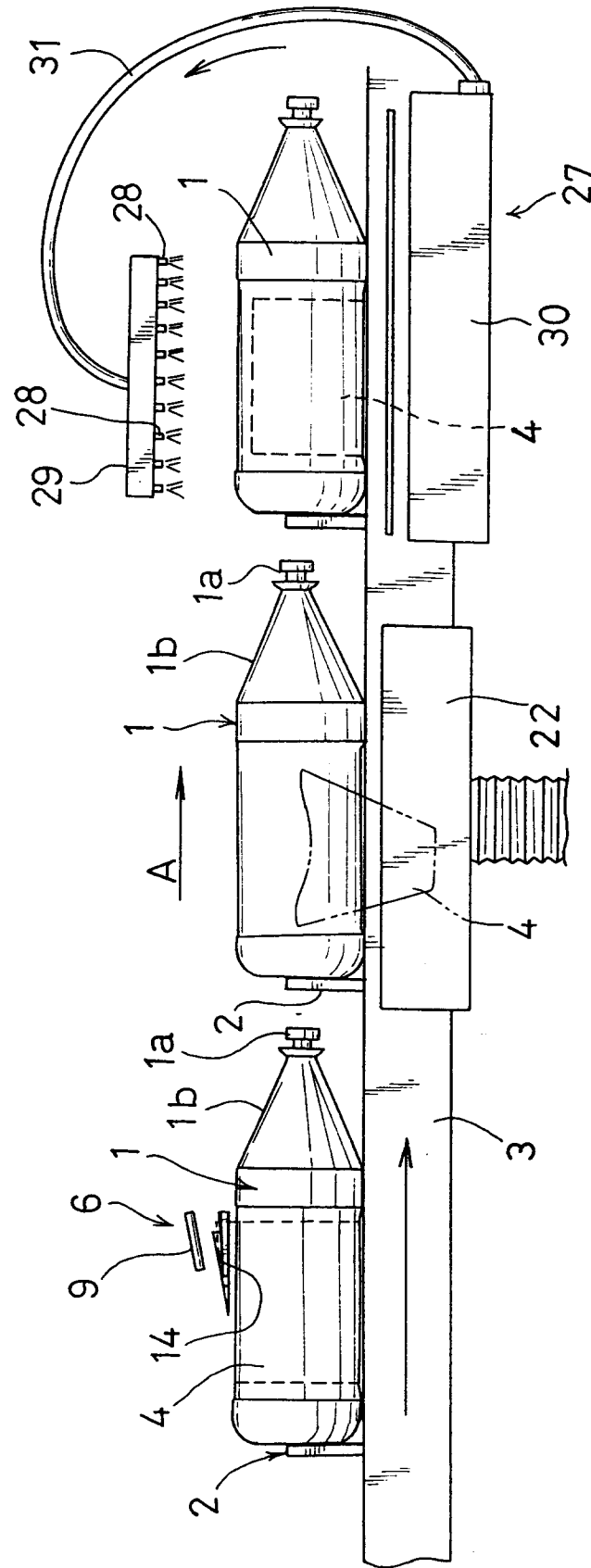


FIG. 2

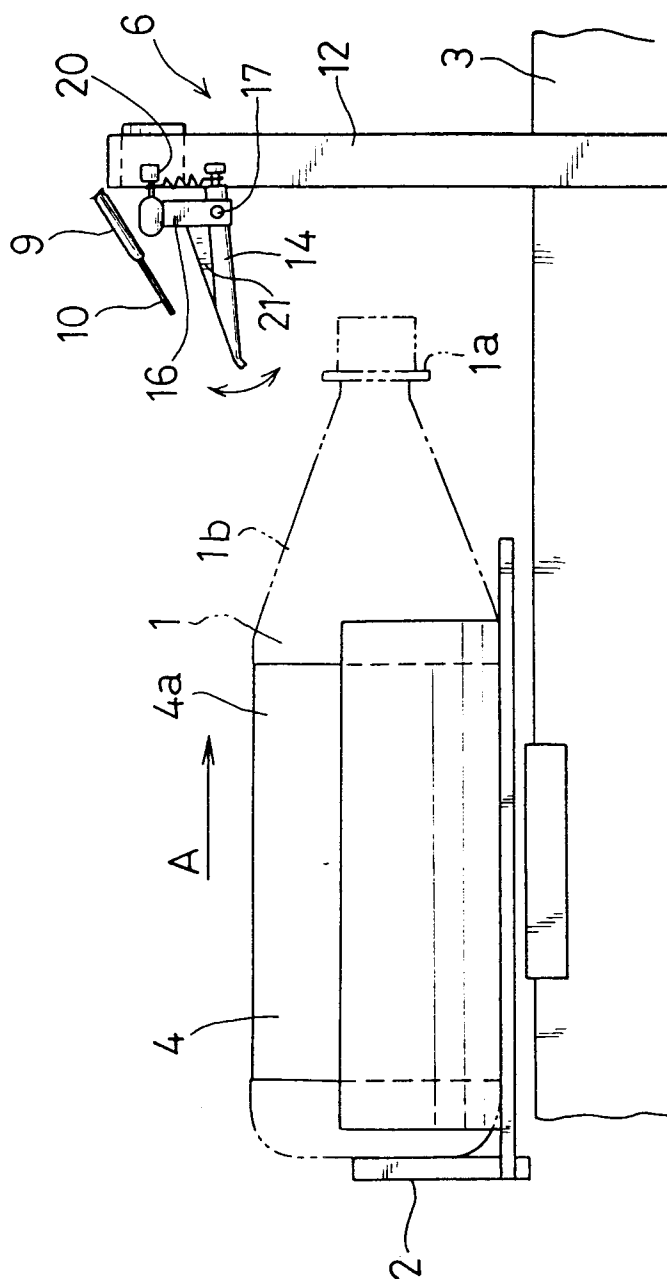


FIG. 3

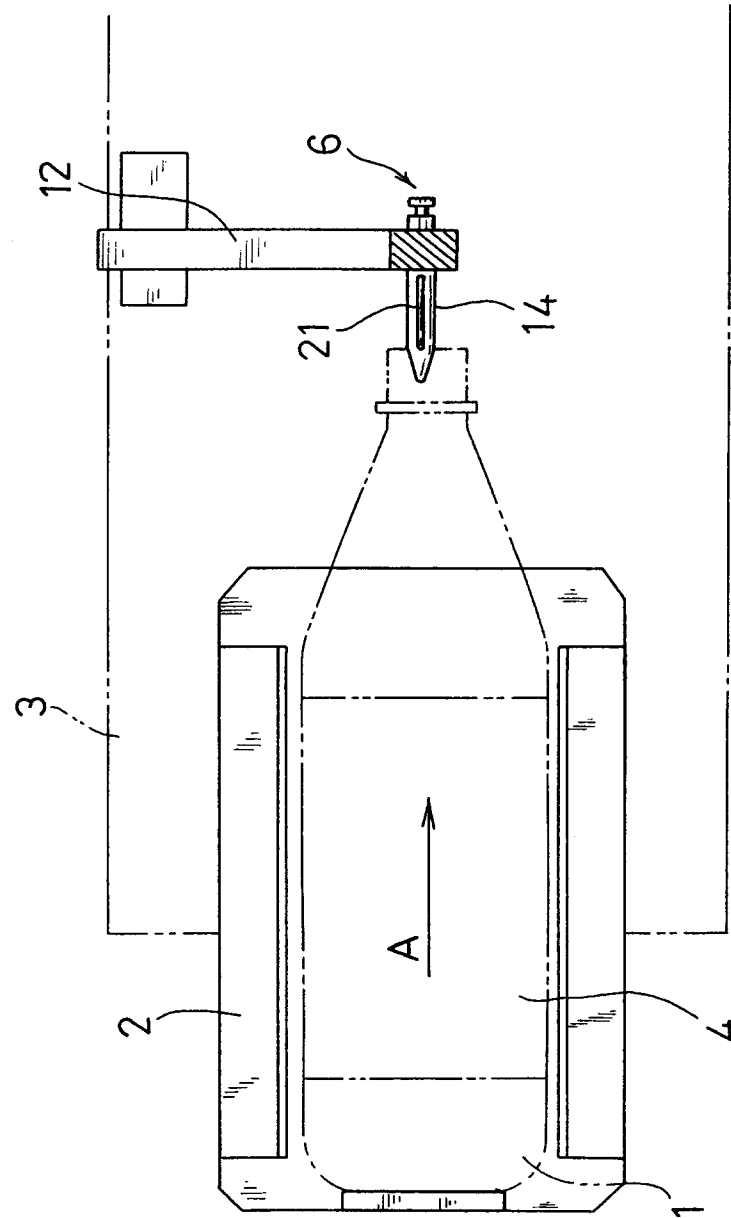


FIG. 4 (a)

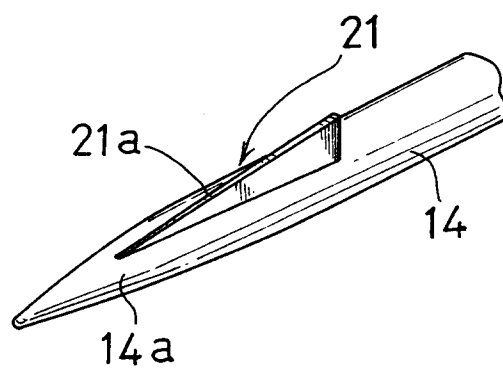


FIG. 4 (b)

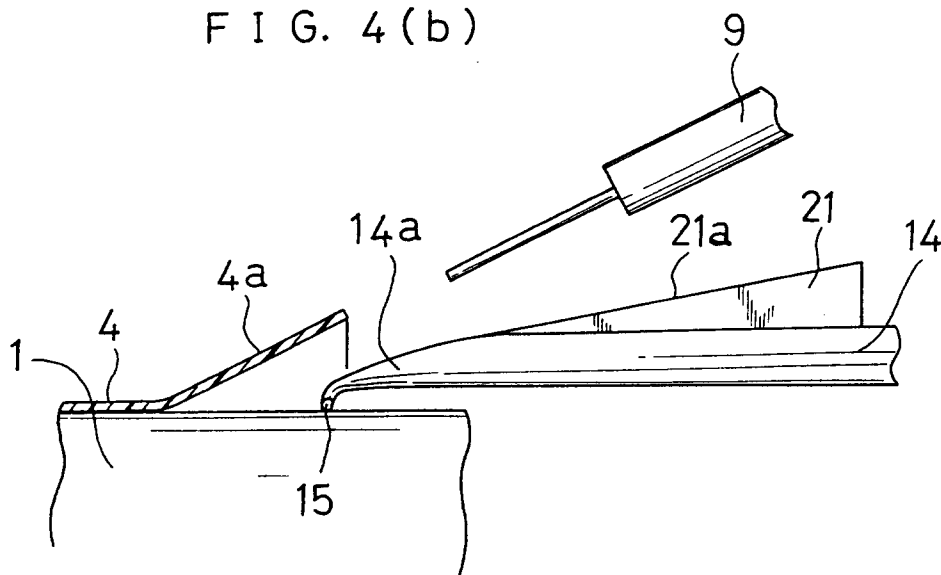


FIG. 4 (c)

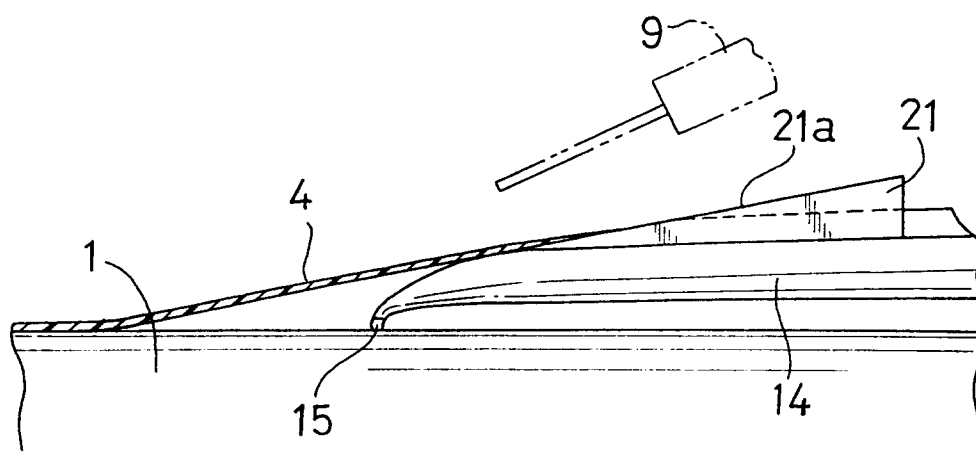


FIG. 5 (a)

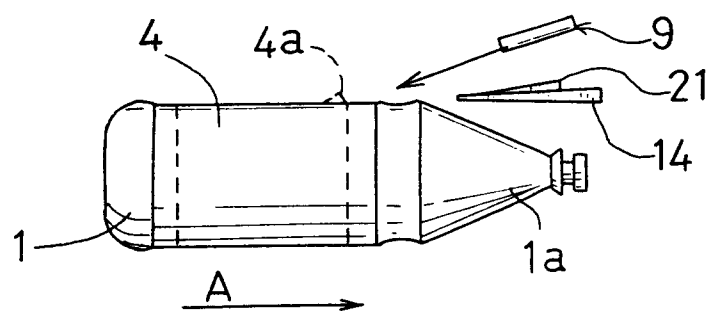


FIG. 5 (b)

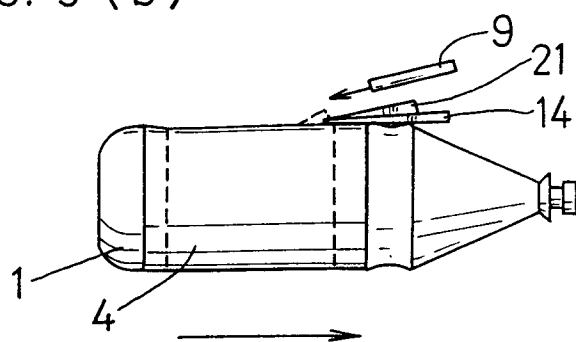


FIG. 5 (c)

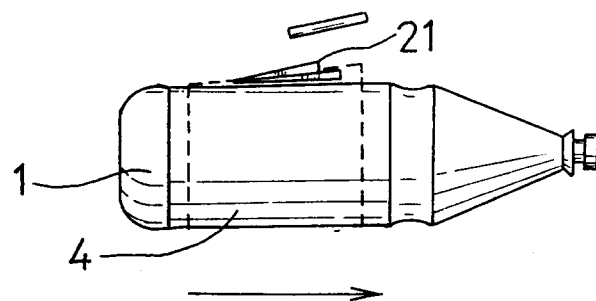


FIG. 5 (d)

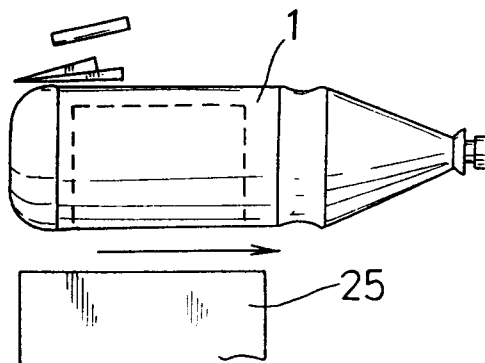


FIG. 6

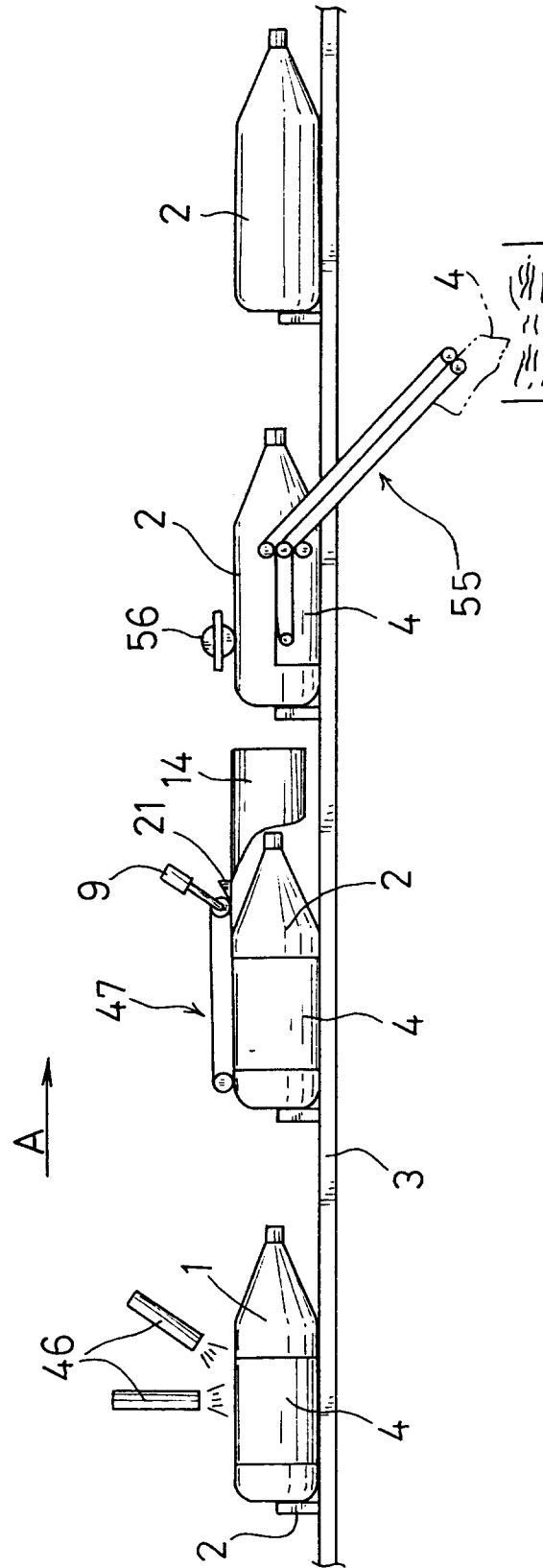


FIG. 7 (a)

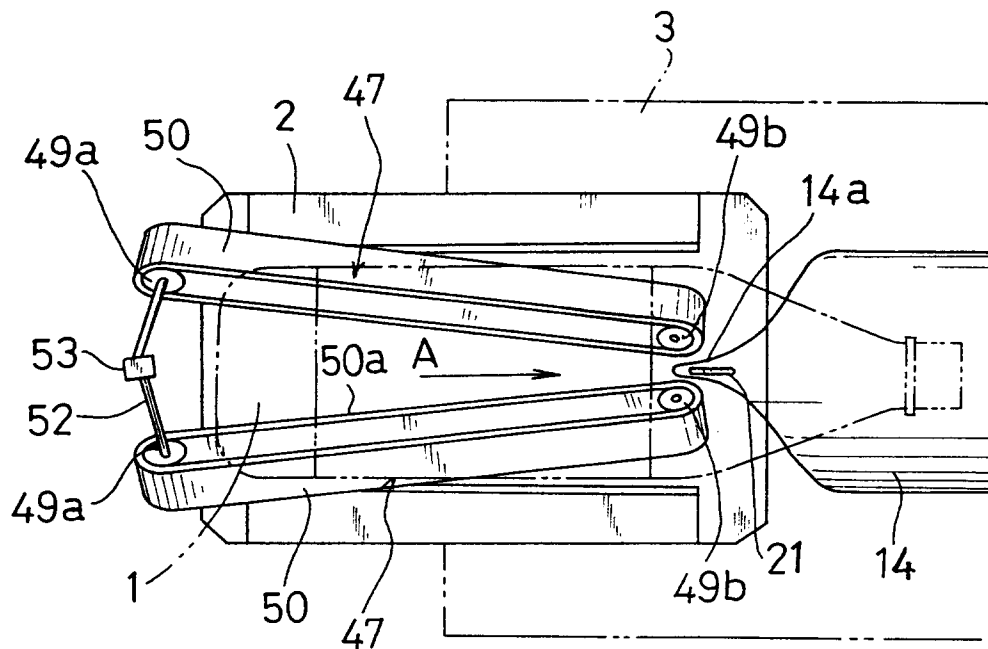


FIG. 7 (b)

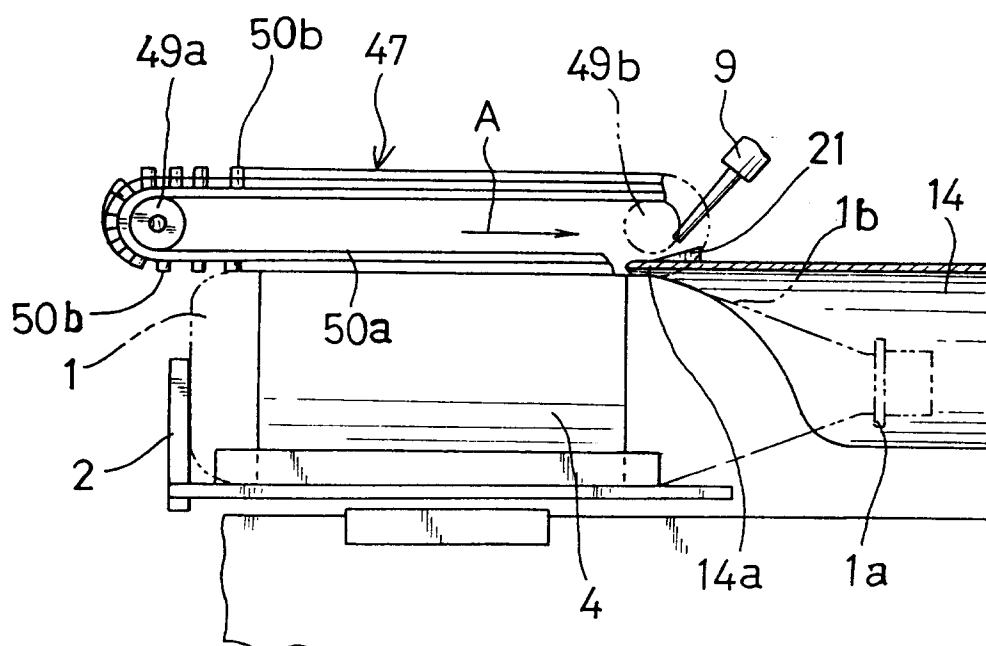


FIG. 8

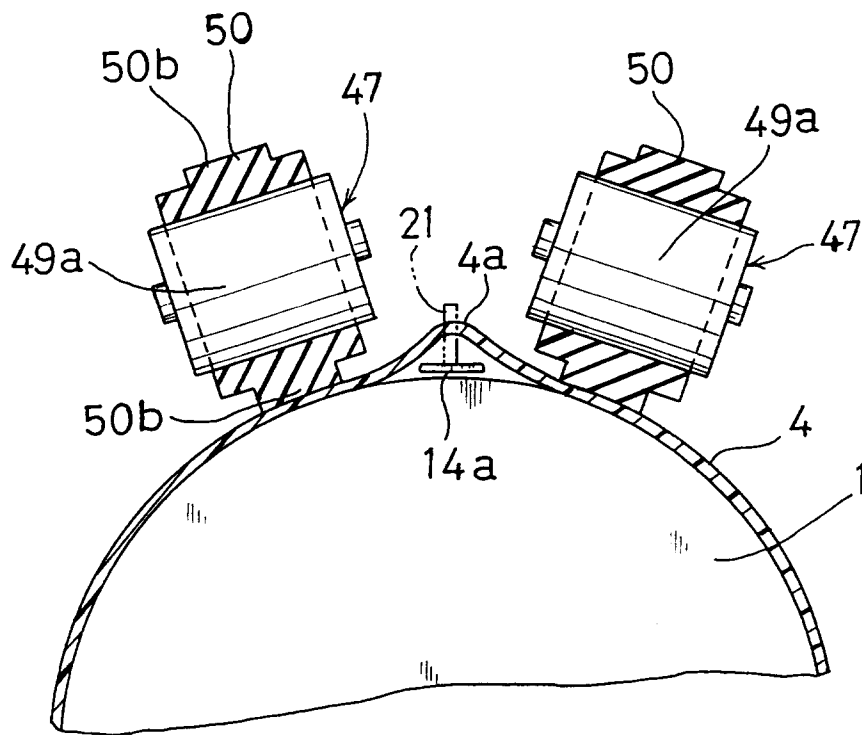


FIG. 9

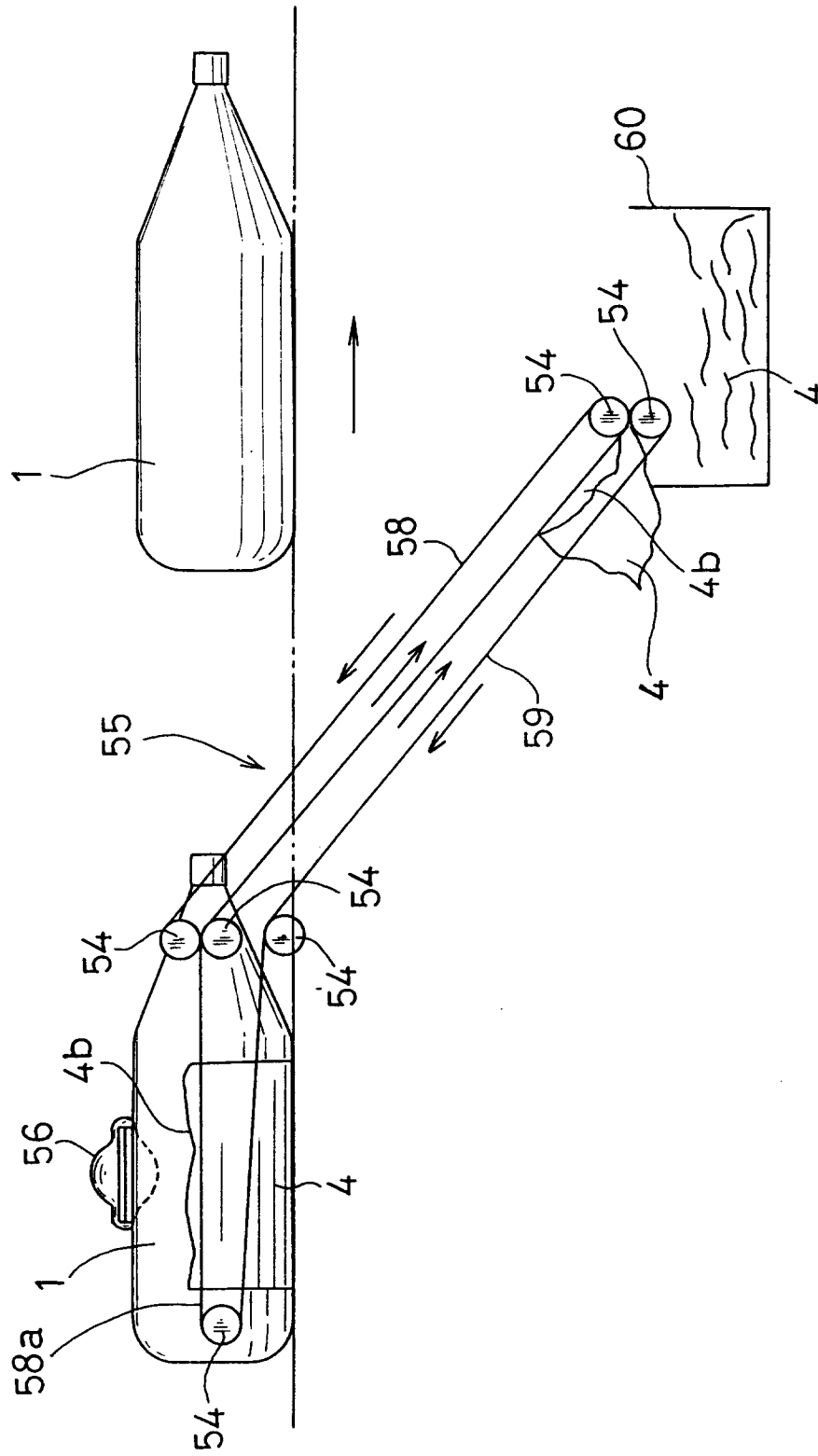


FIG. 10

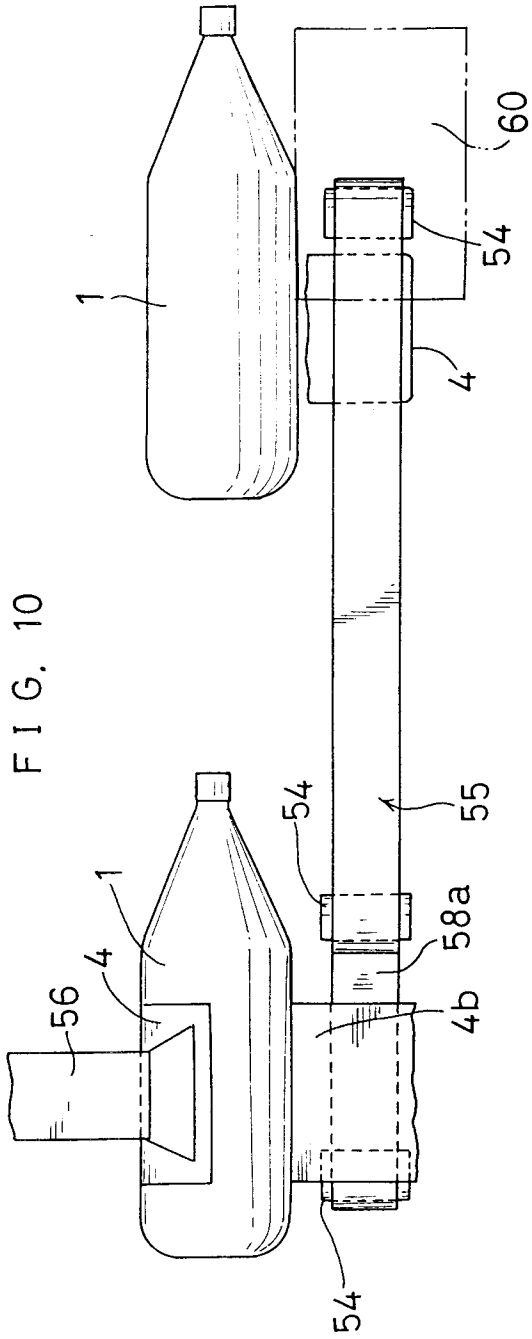
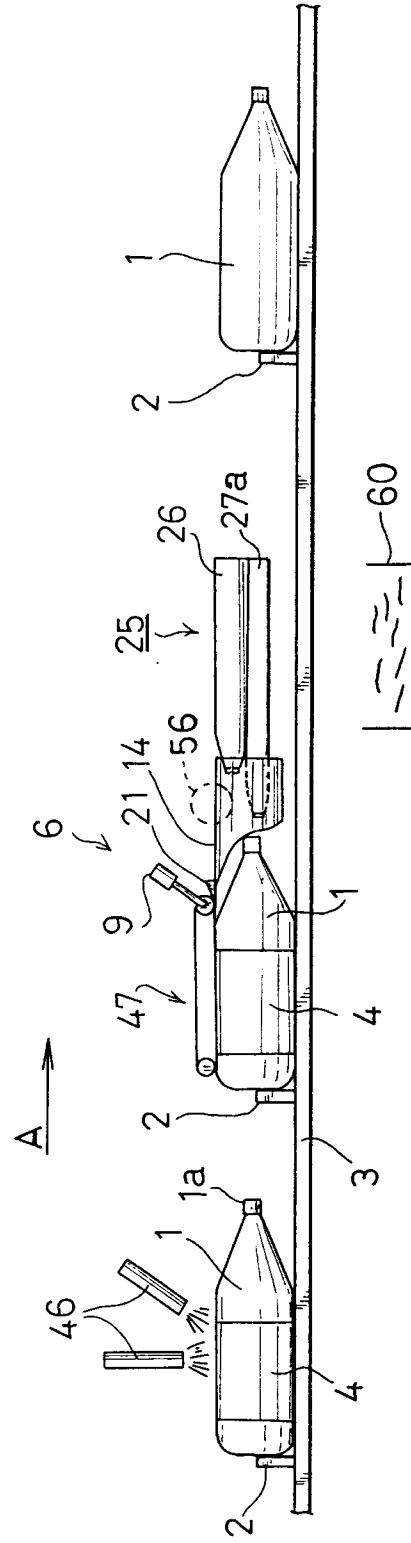


FIG. 11



F I G. 12

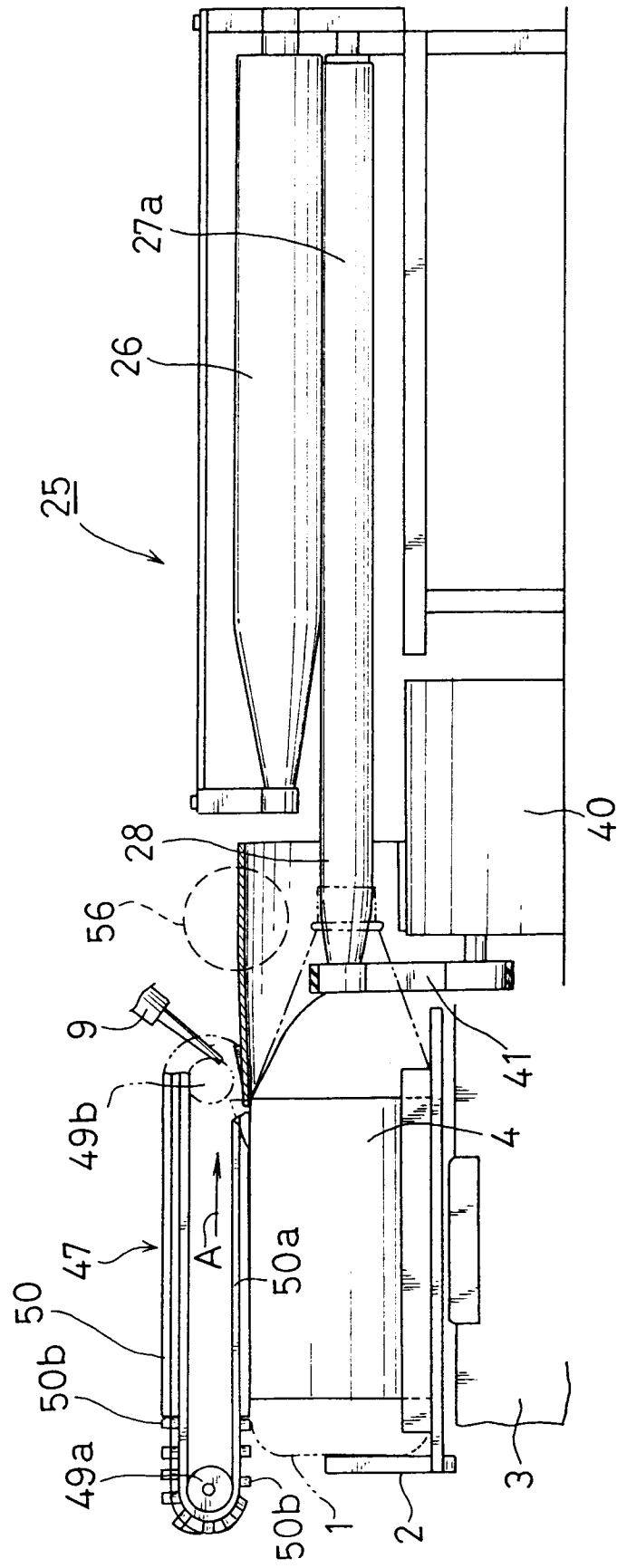


FIG. 13 (a)

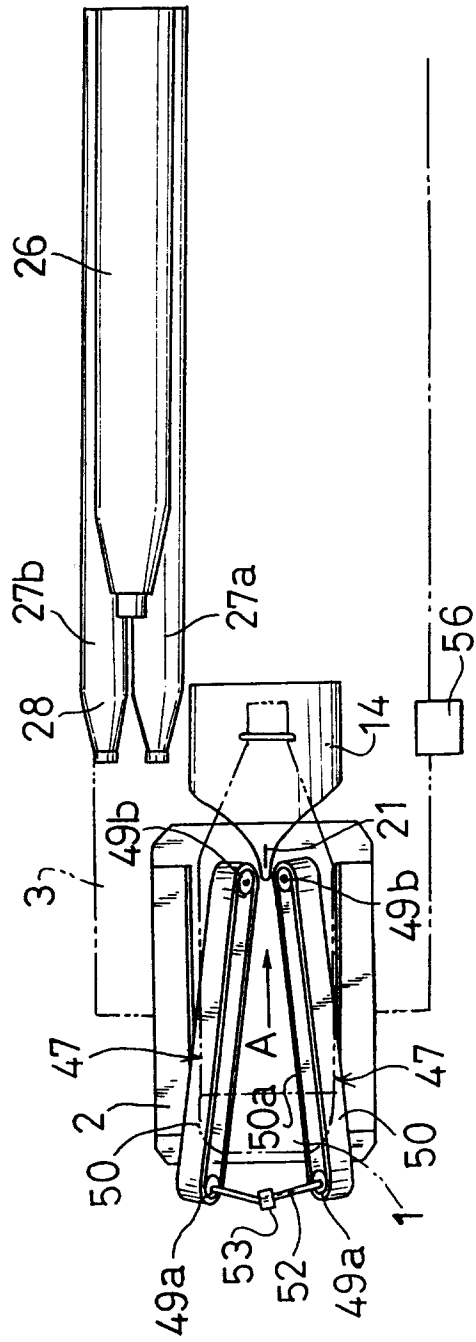


FIG. 13 (b)

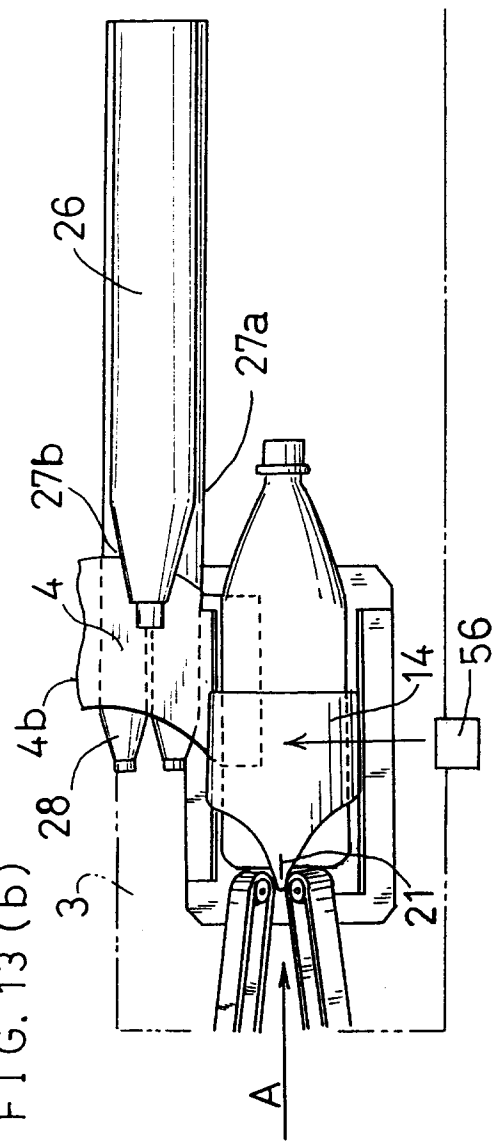


FIG. 14

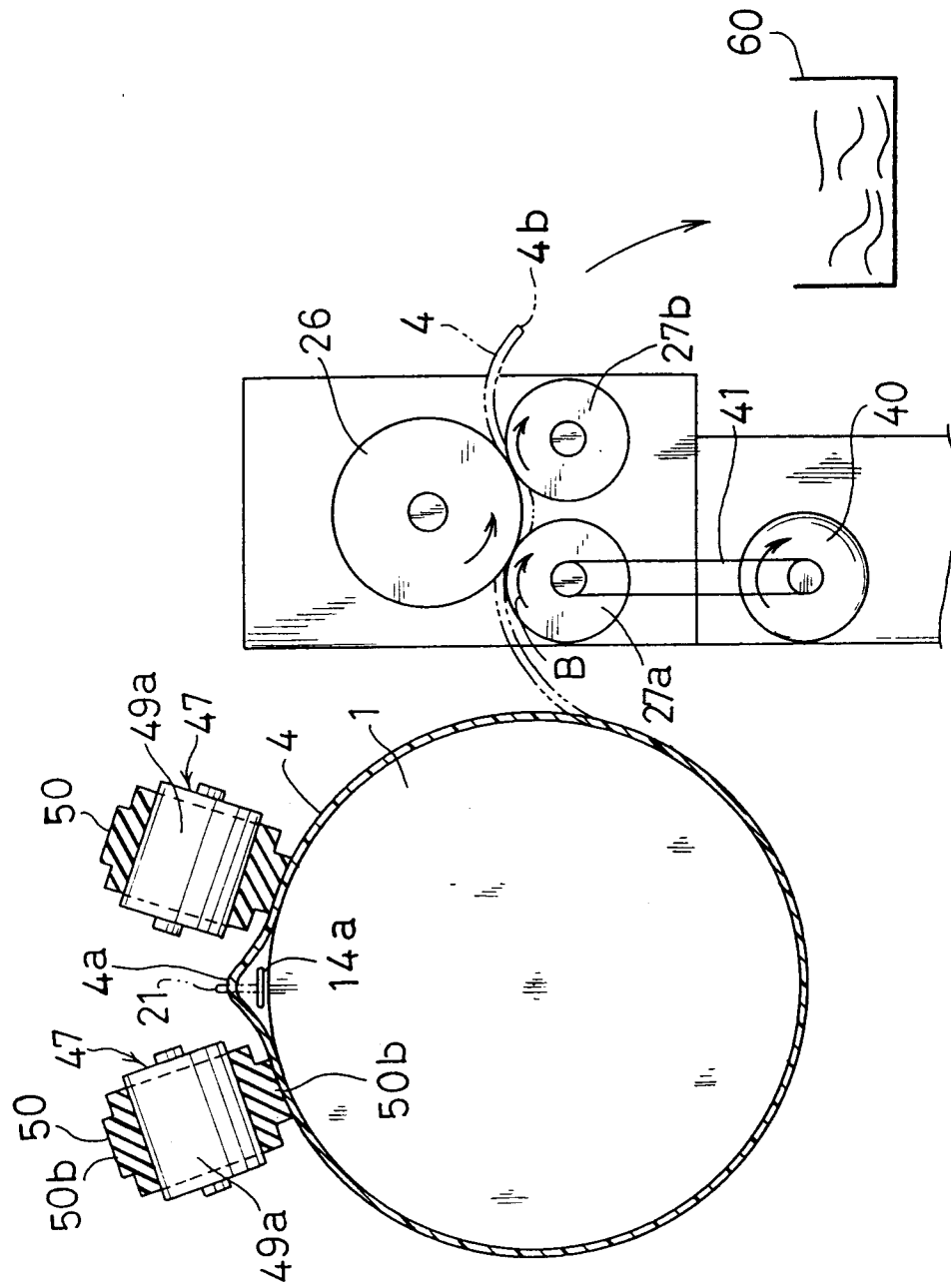


FIG. 15

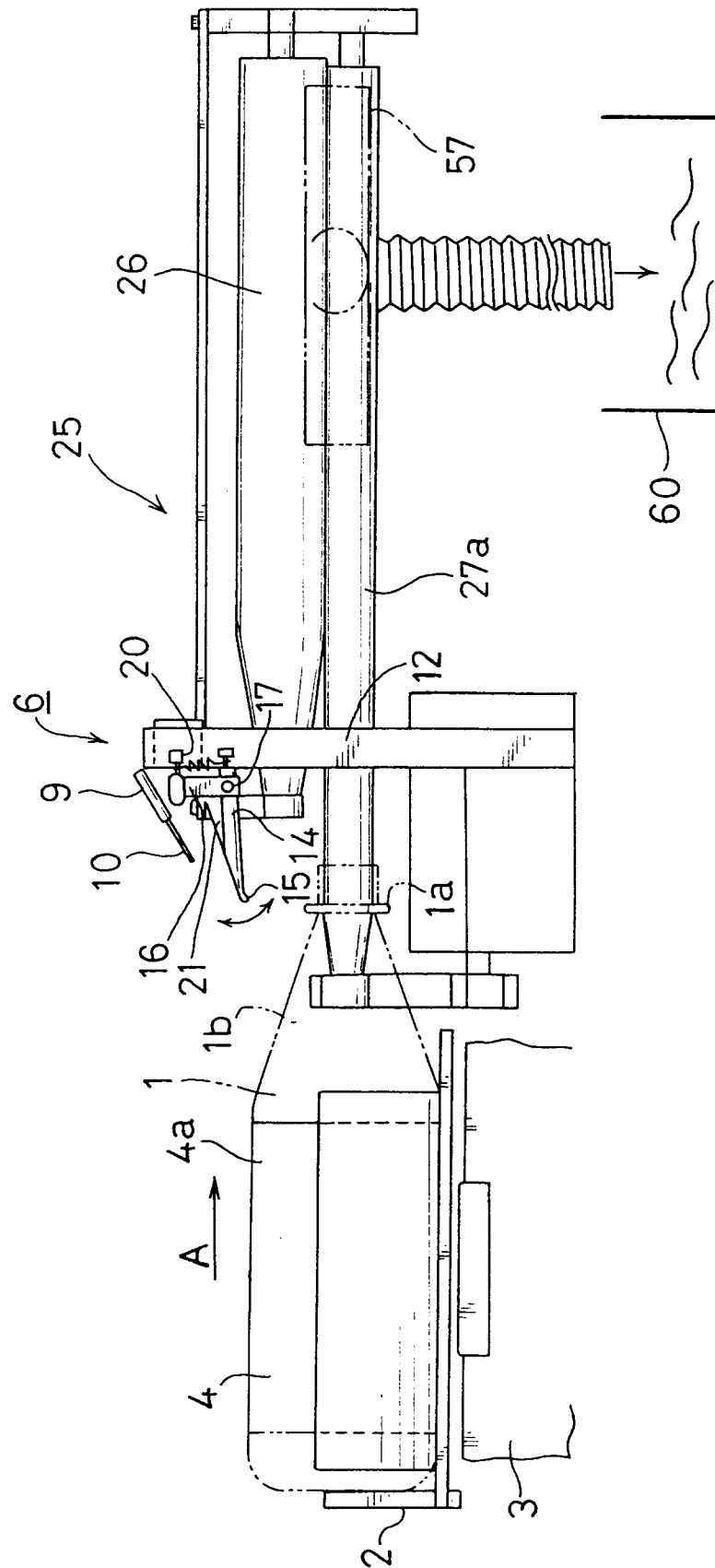


FIG. 16

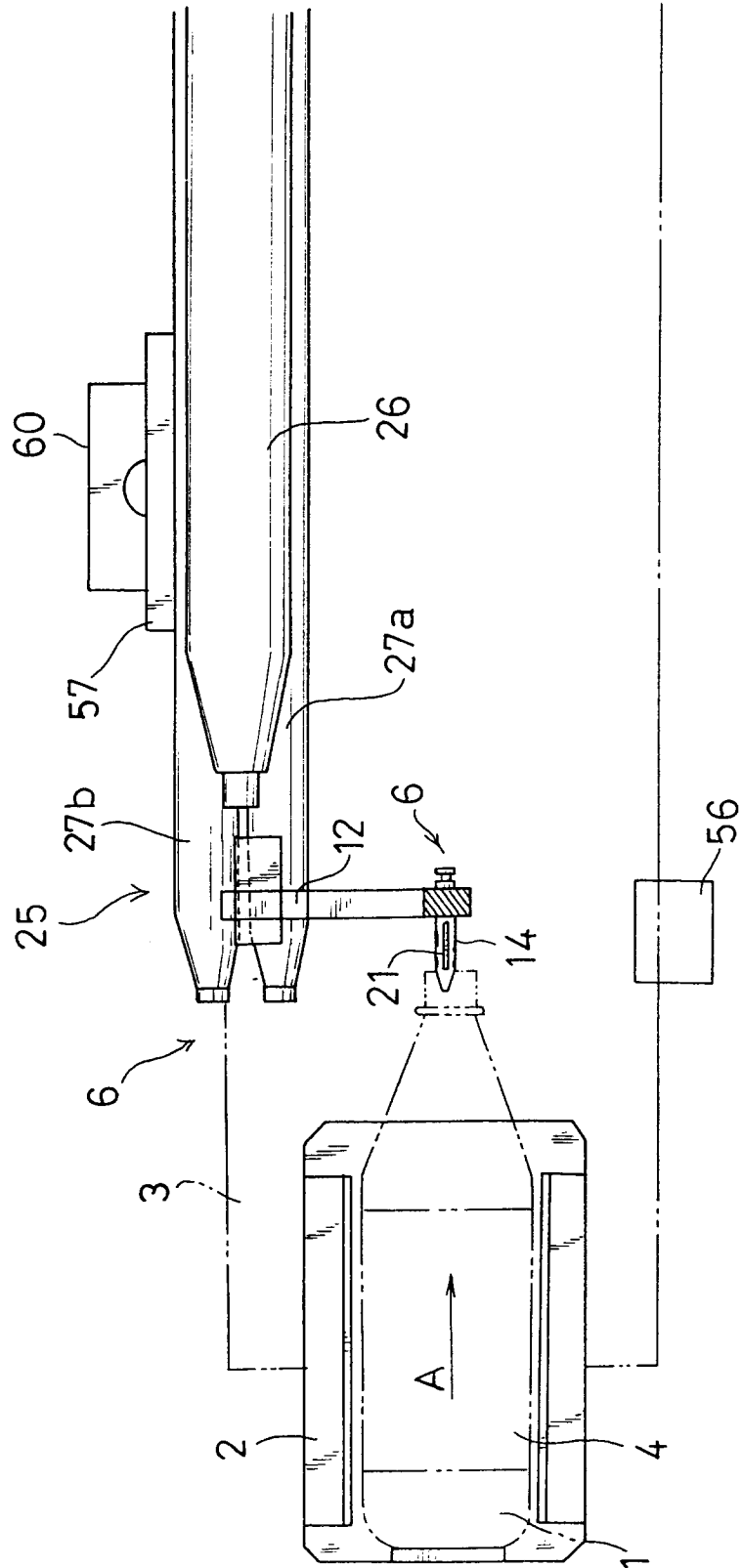


FIG. 17 (a)

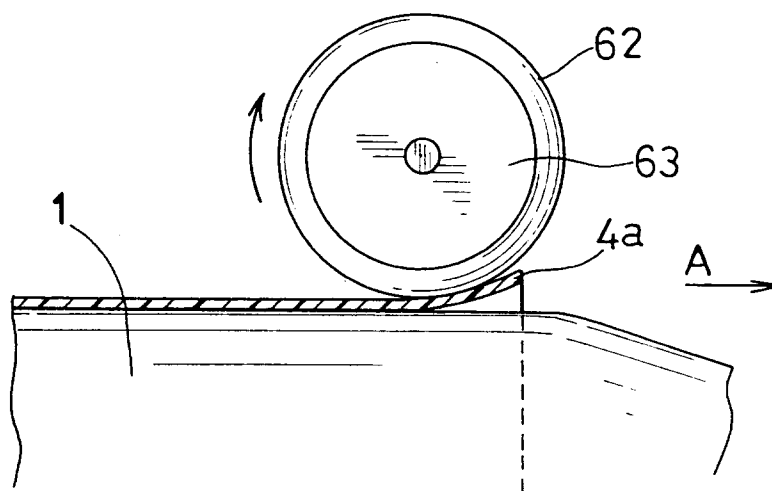


FIG. 17 (b)

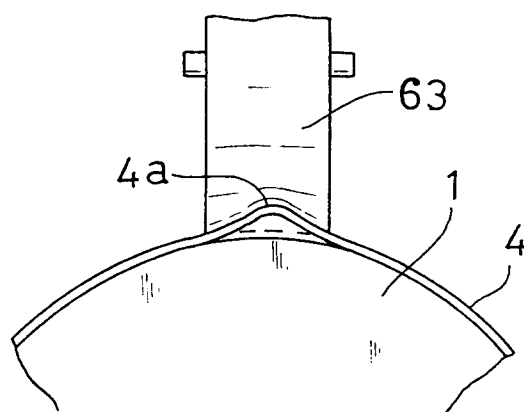


FIG. 17 (c)

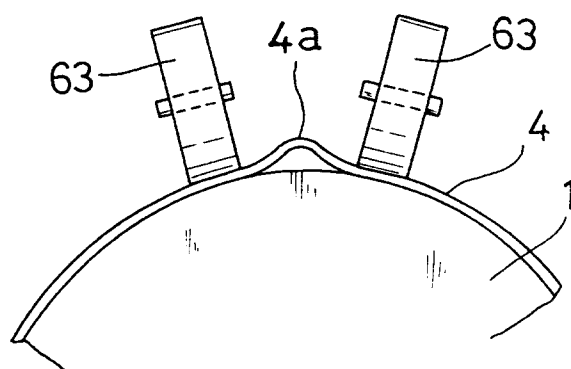


FIG. 18 (a)

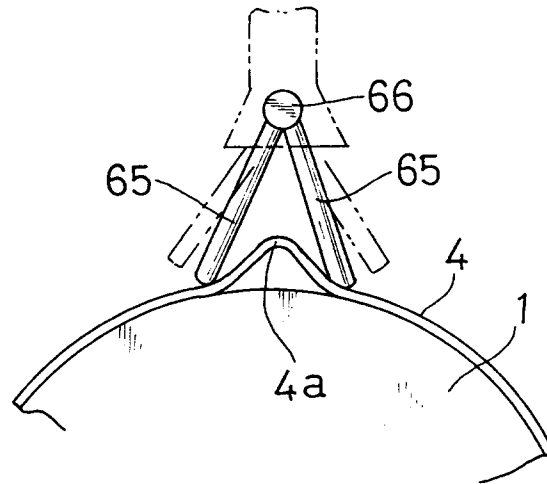


FIG. 18 (b)

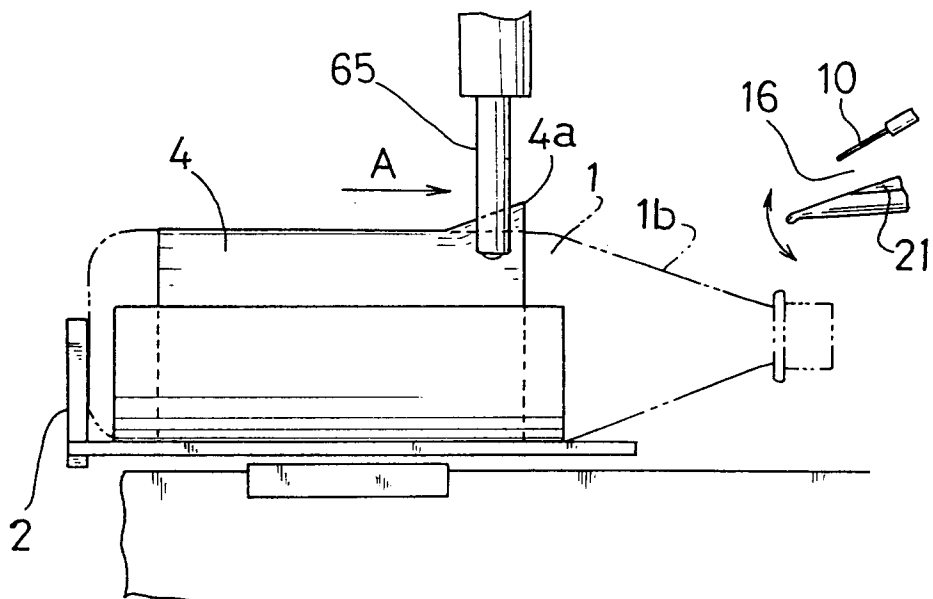


FIG. 19 (a)

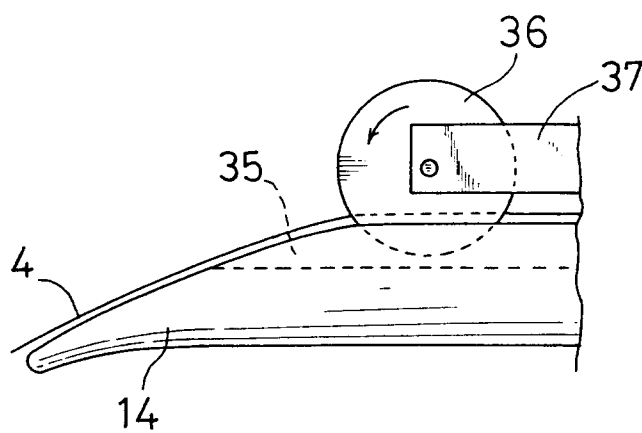


FIG. 19 (b)

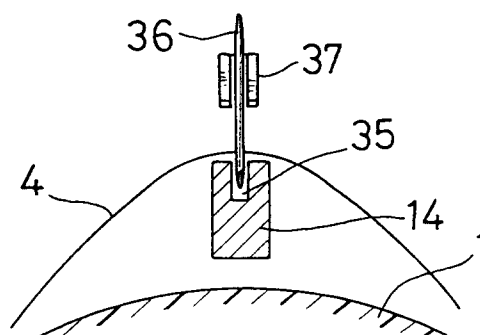
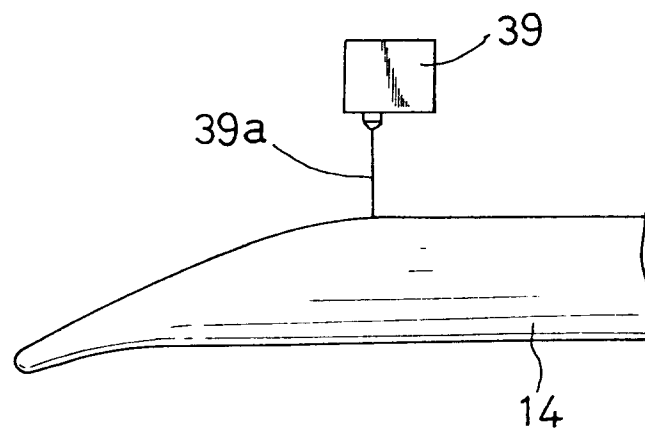
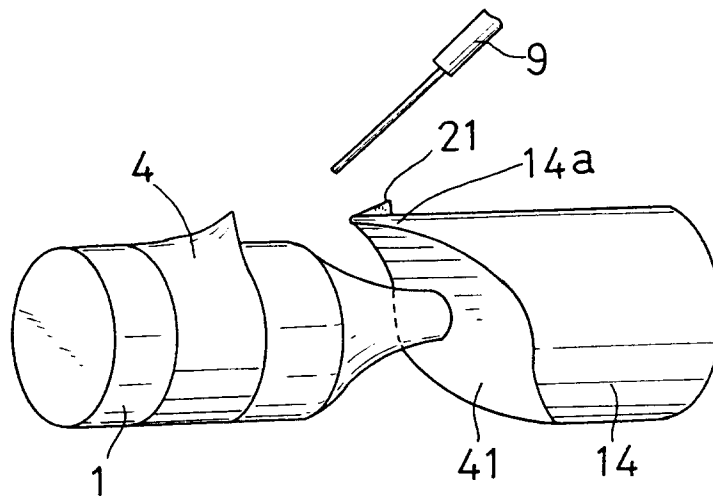


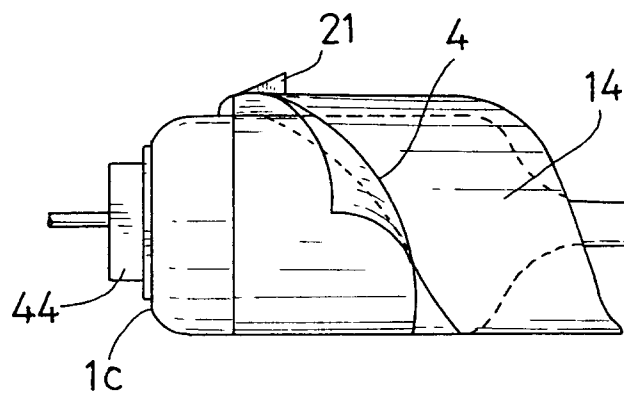
FIG. 19 (c)



F I G. 20 (a)



F I G. 20 (b)



F I G. 20 (c)

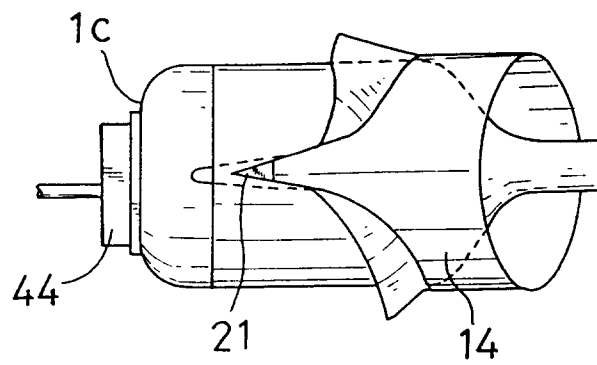


FIG. 21 (a)

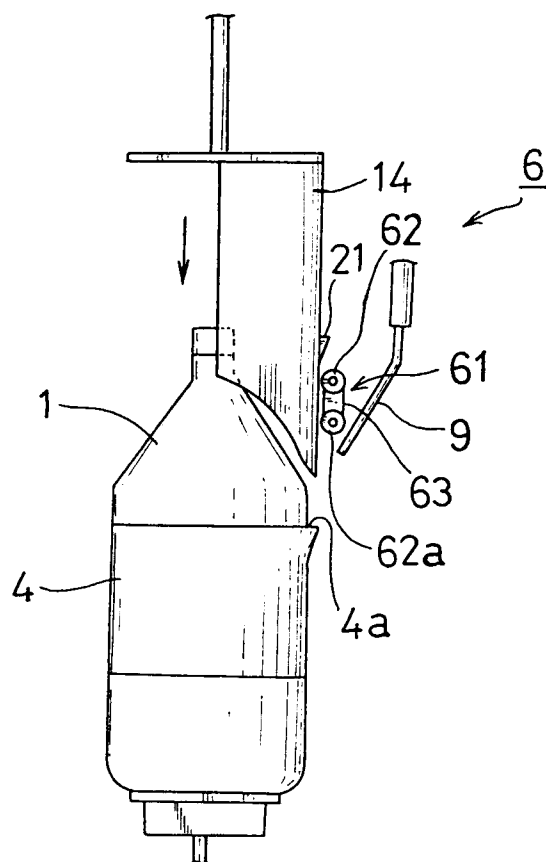
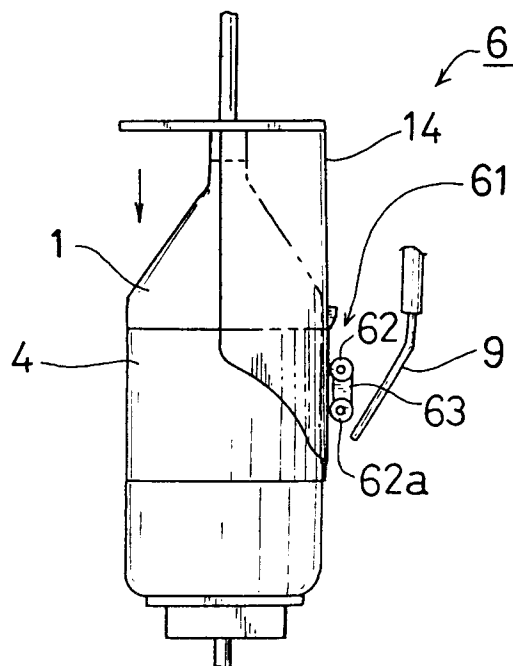
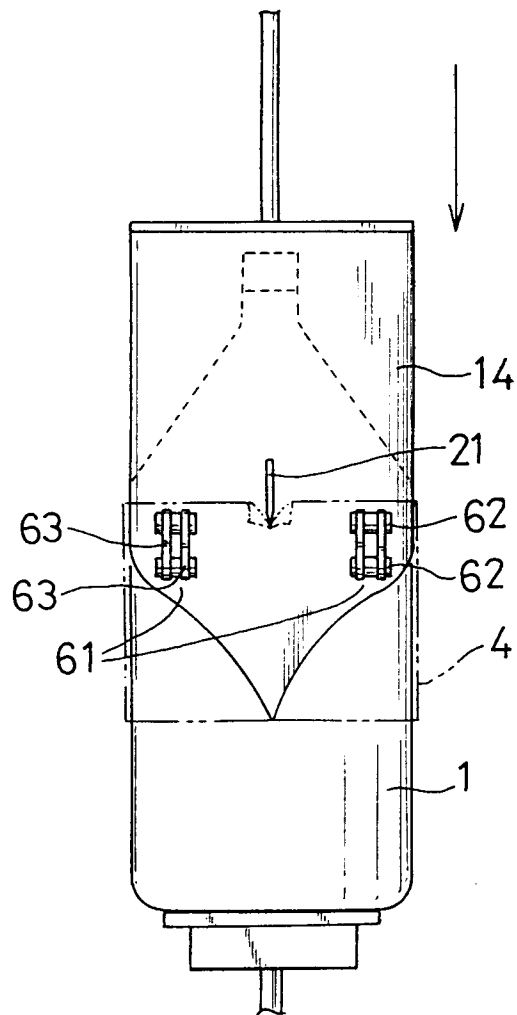


FIG. 21 (b)



F I G. 22





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 25 0203

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 580 985 (ALFILL GETRÄNKETECHNIK GMBH) * column 2, line 52 - column 4, line 39 *	1, 4, 5, 7, 11	B08B9/08 B08B9/20
Y	---	2, 8, 13	
X	PATENT ABSTRACTS OF JAPAN vol. 7 no. 223 (M-247), 4 October 1983 & JP-A-58 118207 (FUJI SEAL KOGYO KK) 14 July 1983, * abstract *	1, 4, 12	
Y	---	2, 3, 5-10	
Y	US-A-4 997 329 (M. HANAMOTO ET AL) * column 6, line 12 - line 30 *	3, 5-7	
Y	---		
Y	WO-A-94 11254 (MASCHINENFABRIEK "CSW" BV) * page 3, line 20 - page 4, line 12 *	9, 10	
P, Y	---		
P, Y	PATENT ABSTRACTS OF JAPAN vol. 95 no. 1 & JP-A-07 016553 (SHIBUYA KOGYO CO LTD) 20 January 1995, * abstract *	13	
A	---		
A	PATENT ABSTRACTS OF JAPAN vol. 17 no. 652 (M-1520), 3 December 1993 & JP-A-05 213326 (SNOW BRAND MILK PROD CO LTD) 24 August 1993, * abstract *	9, 10	B08B B65B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 4 December 1995	Examiner Lilimpakis, E
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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