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(54) Article transfer device and packaging system provided with same

(57) An article transfer device is provided with a funnel-shaped structure and a high pressure air supply pipe. The funnel-shaped structure is provided with an upper end opening adapted to receive the articles being dropped in from above and a lower end opening adapted to allow the articles to drop through to the form-fill-seal machine. An inner space is defined within the funnel-shaped structure between the openings. The upper part of the inner space has a greater cross-sectional area than the cross-sectional area of the lower part of the inner space. A plurality of air ejection holes are formed in an inner peripheral surface of the funnel-shaped structure surrounding the inner space. The plurality of air ejection holes are arranged with respect to one another defining a helical shape pattern about the funnel-shaped structure. Gaseous material is spouted out from the high pressure air supply pipe and into the inner space through the plurality of air ejection holes.

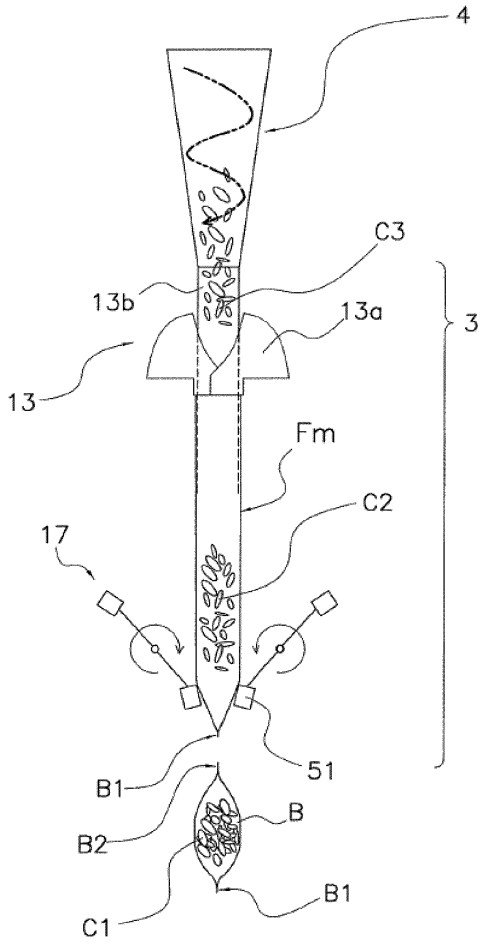

FIG. 8

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Description

TECHNICAL FIELD

[0001] The present invention relates to an article transfer device for transferring an article to a form-fill-seal machine, and a packaging system provided with the same.

BACKGROUND ART

[0002] Conventionally, there have existed form-fill-seal machines for producing bags by shaping a sheet of a packaging material into a tube and, in a state where the interior thereof has been filled with a snack food or other article, laterally sealing the upper and lower end parts of the packaging material. For example, an upright form-fill-seal machine shapes a sheet of a packaging material into a tube, and then vertically seals both vertically overlapping edges of the tubular packaging material. During a state where a dropped article is positioned in the interior space of the tube of packaging material, the upper and lower end parts of a portion of the tube of packaging material serving as a single bag are laterally sealed in sequence, forming a lower sealed part and an upper sealed part in a state where the article is present within the tubular packaging material. To be specific, a lateral seal is made across the leading portion of the bag serving as the upper end part and the following portion of the bag serving as the lower end part, and immediately thereafter (or, alternatively, at the same time) the middle of the laterally sealed portion is vertically separated by a cutter, thus forming the tube of packaging material into a lower sealed part and an upper sealed part. By repeating such an operation, a form-fill-seal machine continuously produces bags filled with articles.

[0003] In a case where potato chips or other articles having a low specific gravity are the article with which the bag is filled, articles in a group may undergo greater vertical separation as they fall, and the articles may get caught in the laterally sealed portions. Various companies have been devoted to innovations for preventing the poor sealing caused by this "catching" phenomenon, such as the technology disclosed in JP 61-190410 A.

SUMMARY OF THE INVENTION

[0004] It is an obj ect of the present invention to provide an article transfer device such that articles being dropped into a form-fill-seal machine can be compactly collected in the form-fill-seal machine.

<Solution to Problems>

[0005] The above-mentioned problem is solved by an article transfer device according to claim 1. Further advantageous effect can be achieved by the subject-matter of the dependent claims. An article transfer device according to a preferred embodiment of the present invention is a device for dropping articles into a form-fill-seal machine. The form-fill-seal machine is a machine that forms a tubular packaging material and seals laterally extending portions of the tubular packaging material so as to produce a bag filled with the dropped articles. The article transfer device is provided with a tubular part and a gaseous material outlet part. The tubular part is provided with an upper end opening adapted to receive the articles being dropped in from above, a lower end opening adapted to direct the articles to drop into the form-fill-seal machine. An inner space is defined within the tubular part between the upper end opening and the lower end opening. An upper part of the inner space of the tubular part has a greater cross-sectional area than the cross-sectional area of a lower part of the inner space. The tubular member includes plurality of holes open to the inner space, the plurality of holes being arranged with respect to one another defining a helical shape pattern (the shape of a wound wire) about an inner peripheral surface the tubular part. Pressurized gaseous material is provided from the gaseous material outlet part to the plurality of holes of the tubular part and into the inner space of the tubular part.

[0006] Herein, gaseous material is spouted out through the gaseous material outlet part and into the inner space of the tubular part from the plurality of holes arranged in a helical shape on the inner peripheral surface thereof. In so doing, the gaseous material moves in a helically shaped flow within the inner space, and rotational force (gyrational force) along the inner peripheral surface of the tubular part acts on the articles dropping through the inner space of the tubular part. The dropped articles are thereby made to move through to the form-fill-seal machine while undergoing a gyrating motion, improving the process of filling of the bag with the articles in the form-fill-seal machine.

[0007] The gaseous material may be made either to spout continuously or to spout intermittently through the gaseous material outlet part from the plurality of holes of the tubular part toward the inner space thereof.

[0008] Also, the cross-sectional area of the inner space of the tubular part preferably has a gradual increase from the lower end opening toward the upper end opening. In other words, the tubular part has an overall funnel-shape. In such a case, the inner peripheral surface will not have any steeply stepped parts or the like, thus providing a greater reduction in damage to the articles caused when the articles collide with the inner peripheral surface.

[0009] There is an angle of inclination of the inner peripheral surface of the tubular part, relative to a vertical line, that is preferably 3° to 25°. The reason for this is that when the angle of incline is greater than 25°, the articles will physically collide with the inner peripheral surface with greater frequency and the articles will inevitably suffer a certain degree of damage, even though, for example, the gaseous material is spouted to the inner space from the plurality of holes formed in the inner peripheral surface. In cases addressing potato chips and other articles having a low specific gravity, it is further preferable to set the angle of incline within the range of 3° to 20°.

[0010] A bag-making system according to a preferred embodiment of the present invention is a bag-making system composed of the article transfer device according to the preferred embodiment of the present invention described above as well as of a form-fill-seal machine. The form-fill-seal machine has a former part for shaping a sheet of a packaging material into a tube, and a lateral sealing part for laterally sealing the tubular packaging material in a state where articles have been dropped into the packaging material that has been made into a tube by the former part. The form-fill-seal machine also produces a bag filled with the articles. The article transfer device is positioned above the former part of the form-fill-seal machine and allows the articles to drop through to the interior space of the tubular packaging material.

<Advantageous Effects of Invention>

[0011] According to the preferred embodiment of the present invention, the articles will drop through to the form-fill-seal machine while engaging in a gyrating motion, and the articles are compactly collected in the form-fill-seal machine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG 1 is a schematic perspective view of an article transfer device according to an embodiment of the present invention, as well as of a form-fill-seal machine and a weighing machine.

[0013] FIG 2 is a block diagram representing schematically the control connections between the article transfer device, the form-fill-seal machine, and the weighing machine.

[0014] FIG 3 is a schematic perspective view illustrating the arrangement of the article transfer device relative to the primary components of the form-fill-seal machine.

[0015] FIG 4 is a schematic view of the article transfer device, including a side view of the funnel-shaped structure.

[0016] FIG 5 is a plan view of the funnel-shaped structure.

[0017] FIG 6 is a cross-sectional view along arrow VI-VI of FIG 5.

[0018] FIG 7 is a drawing illustrating the state of the articles when being dropped into the article transfer device and the form-fill-seal machine with the form-fill-seal machine beginning to form laterally extending sealed portions on the packaging material.

[0019] FIG 8 is a drawing illustrating the state of the articles when being dropped into the article transfer device and the form-fill-seal machine with the form-fill-seal machine completing the laterally extending sealed portions on the packaging material and cutting off a formed bag with the dropped articles inside the bag.

DESCRIPTION OF EMBODIMENTS

(Overall Schematic)

[0020] FIG 1 illustrates a bag-making system composed of an upright form-fill-seal machine 3 as well as an article transfer device 4 according to an embodiment of the present invention, together with a weighing machine 2 disposed thereabove. The bag-making system produces a bag by shaping a film into a tube, dropping potato chips or other articles (food products) having a low apparent specific gravity, serving as the articles, into the tube shaped film, and then vertically and laterally sealing the film to form a bag filed with the articles.

[0021] The articles are dropped in by predetermined amounts from the weighing machine 2 above the article transfer device 4 of the bag-making system. The weighing machine 2 is a combination weighing device constituted of a feeder, a pool hopper 24, a weighing hopper 25, an aggregate discharge chute 26, and other elements.

[0022] To increase the efficiency with which the articles are filled in the form-fill-seal machine 3, the article transfer device 4 applies pressure to the articles such that the articles are turned along an inner peripheral surface 40c of an inner funnel member 41 to be described later, and spouts air from the inner peripheral surface 40c so as to reduce damage to the articles (which, in a case where the articles are potato chips, could be cracking of the potato chips) caused by the contact between the inner peripheral surface 40c and the articles.

[0023] The articles, which have been dropped from the weighing machine 2 into the article transfer device 4, and are then dropped further downward from the article transfer device 4, enter the form-fill-seal machine 3. The form-fill-seal machine 3 is provided with a form-fill-seal unit 5, which is a body component for bagging the articles (see FIG 3); a film supply unit 6 for supplying the form-fill-seal unit 5 with a film F to be made into a bag; and a control device 90 for controlling

the movements of the actuated portions of both units 5, 6 (see FIG 2). The form-fill-seal machine 3 continuously produces bags B filled with the articles (see FIGS. 3 and 8) by covering the articles with a film and then vertically sealing and laterally sealing the tube of the film.

(Film supply unit of the form-fill-seal machine)

[0024] The film supply unit 6 is a unit for supplying a shaping mechanism 13 of the form-fill-seal unit 5 with a sheet of the film F, and is provided adjacent to the form-fill-seal unit 5. A film roll 6b around which the film F is wound is positioned in the film supply unit 6, and the film F is reeled out from the film roll 6b.

[0025] The film F reeled out from the film roll 6b is conveyed by being dispensed by the operation of a dispensing motor 6a for causing the film roll 6b to rotate (see FIG 2), and then stretched out toward the form-fill-seal unit 5 by the operation of a pull-down belt mechanism 14 of the form-fill-seal unit 5, to be described later. The movements of the dispensing motor 6a and the pull-down belt mechanism 14 are controlled by the control device 90.

(Form-fill-seal unit of the form-fill-seal machine)

[0026] The form-fill-seal unit 5, as illustrated in FIG 3, has the shaping mechanism 13 for shaping the film F, which is issued in a sheet, into a tube; the pull-down belt mechanism 14 for downwardly conveying the film F that has taken a tubular shape (hereinafter called the tubular film Fm); a vertical sealing mechanism 15 for vertically sealing the overlapping portions of both edges of the tubular film Fm; and a lateral sealing mechanism 17 for heat-sealing the upper and lower end parts of a bag B by laterally sealing the tubular film Fm.

(Shaping mechanism 13)

[0027] The shaping mechanism 13 has a tube 13b and a former 13a. The tube 13b is a cylindrical member, the upper and lower ends of which are open. A round opening at the upper end of the tube 13b is connected to a lower end opening 40b of a funnel-shaped structure of the article transfer device 4, to be described later.

[0028] The former 13a is disposed so as to surround the tube 13b. The former 13a shapes a sheet of the film F so as to be wound around the circumference of the tube 13b (see FIG 3). The sheet of the film F reeled out from the film roller 6b is shaped into a tube upon passing between the former 13a and the lower tube 13b; the upper surface of the film F becomes an inner peripheral surface of the tubular film Fm, and the lower surface of the film F becomes an outer peripheral surface of the tubular film Fm.

(Pull-down belt mechanism 14)

[0029] The pull-down belt mechanism 14 is a mechanism for chucking and downwardly conveying the tubular film Fm that has been wound around the tube 13b, and, as illustrated in FIG 3, has belts 14c provided to each of the left and right sides thereof across the tube 13b. In the pull-down belt mechanism 14, the belts 14c, which function so as to perform chucking, are turned by an actuation roller 14a and a driven roller 14b, thus bearing the tubular film Fm downward. However, FIG 3 omits an illustration of a roller actuation motor, which causes the actuation roller 14a and the like to rotate.

(Vertical sealing mechanism 15)

[0030] The vertical sealing mechanism 15 is a mechanism for vertically sealing the overlapping portions of the tubular film Fm that has been wound around the tube 13b, using heating while pressing down on the tube 13b with a predetermined amount of pressure. The vertical sealing mechanism 15 is positioned at the front side of the tube 13b and has a heater, as well as a heater belt, which is heated by the heater and is in contact with the overlapping portions of the tubular film Fm. The vertical sealing mechanism 15 is also provided with an actuation device (not shown) adapted to bring the heater belt closer to or farther away from the tube 13b.

(Lateral sealing mechanism 17)

[0031] The lateral sealing mechanism 17 is disposed below the shaping mechanism 13, the pull-down belt mechanism 14, and the vertical sealing mechanism 15. The lateral sealing mechanism 17 is a mechanism that includes a pair of sealing jaws 51 having a built-in heater (see FIGS. 3, 7 and 8).

[0032] The pair of sealing jaws 51 gyrate in a substantially D-shaped manner while tracing mutually symmetrical trajectories. The actuation mechanism used for the gyrating movement is, for example, the technique disclosed in U.S. Patent No. 5,881,539 (which is incorporated herein by reference in its entirety), and is provided with a jaw-pushing motor

51a and a gyrating motor 51b, which are illustrated in FIG 2. The pair of sealing jaws 51 that gyrate in a substantially D-shaped manner clasp the tubular film Fm in a state of being mutually pushed together, where (lateral) sealing is performed by the application of pressure and heat to a portion of the tubular film Fm that is to become the upper and lower end parts of the bag. In addition, a cutter (not shown) is built into the interior of one of the sealing jaws 51. The cutter is responsible for separating the bag B from the tubular film Fm that follows, at a central position in the height direction of the portion laterally sealed by the sealing jaws 51. As illustrated in FIG 8, the lateral sealing forms a lower sealed part B1 and an upper sealed part B2 on the bag B that has been separated.

(Article transfer device)

[0033] The article transfer device 4 is a device deployed with the objective of increasing the compactness in the vertical direction of articles (see the group of articles C2 in FIG 8) that are dropped through the inside of the tubular film Fm toward the lower sealed part B1. Deploying the article transfer device 4 improves the efficiency at which the tubular film Fm following the lower sealed part B1 can be filled with the group of articles, and reduces the amount of dead space (space in which there are no articles) in the interior space of the tubular film Fm in the state where the group of articles is present inside. Specifically, without the article transfer device 4, the state of distribution of the group of articles in the interior space of the tubular film Fm becomes an inverted cone shape, but deploying the article transfer device 4 causes the articles to also enter the two side portions of the space directly above the lower sealed part B1.

[0034] The article transfer device 4 is constituted primarily of the funnel-shaped structure 40 and a high pressure air supply pipe 49.

[0035] The funnel-shaped structure 40, as illustrated in FIGS. 4 to 6, is a tubular structure made of transparent plastic composed of the inner funnel member 41, an outer funnel member 43, an upper circular lid member 45, and a lower circular lid member 47. The funnel-shaped structure also has an upper end opening 40a formed at the upper end thereof and a lower end opening 40b formed at the lower end thereof.

[0036] The inner funnel member 41, which opens both above and below, is a funnel-shaped member surrounding an inner space S2 of the funnel-shaped structure 40, and the inner peripheral surface thereof serves as the inner peripheral surface 40c of the funnel-shaped structure 40. A plurality of air ejection holes 41c lined up in a helical shape are formed in the inner peripheral surface 40c, from the upper part to the lower part. Herein, 30 or more of the air ejection holes 41c are formed, as illustrated in FIG 5, which is a top plan view. As seen in this plan view, the air ejection holes 41c are lined up along a curved line (see FIG 5) that approaches closer and closer to the center while gyrating (a spiraling line), being herein lined up along a spiraling line that wraps twice around the inner surface of the inner funnel member 41 in the spiral or helical shape. The opening at the lower end of the inner funnel member 41 serves as the lower end opening 40b of the funnel-shaped structure 40. Also, as illustrated in FIGS. 4 to 6, the inner space S2 of the funnel-shaped structure 40, which is the space inside the funnel-shaped inner funnel member 41, has a greater cross-sectional area at the upper part than the cross-sectional area at the lower part, and the cross-sectional area of the inner space S2 gradually increases from the lower end opening 40b toward the upper end opening 40a.

[0037] The outer funnel member 43 is a funnel-shaped member having a greater outer diameter than the inner funnel member 41 at any height position. The inner peripheral surface and outer peripheral surface of both the outer funnel member 43 and the inner funnel member 41 all have an equivalent angle of incline relative to a vertical line, the angle of incline being set within the range of 3° to 25°. A round hole is formed in the outer funnel member 43, and a socket at the distal end of the high pressure air supply pipe 49 (described below) is mounted in this round hole.

[0038] The upper circular lid member 45 and a lower circular lid member 47 are members provided in order to block off, from both above and below, the tubular space sandwiched by the tubular inner funnel member 41 and outer funnel member 43. The upper circular lid member 45 and the lower circular lid member 47 may be shaped integrally with the inner funnel member 41 or the outer funnel member 43, or may be separate bodies. The tubular space sandwiched between the inner funnel member 41 and the outer funnel member 43, which is blocked off by the upper circular lid member 45 and the lower circular lid member 47, is hereinafter referred to as a high pressure air supply space S1 (see FIGS. 4 and 6) and serves as a manifold. An opening of the upper circular lid member 45 serves as the upper end opening 40a of the funnel-shaped structure 40.

[0039] The high pressure air supply pipe 49 has a tip that connects to the round hole formed in the outer funnel member 43 via the socket, and sends high pressure air into the high pressure air supply space S1 of the funnel-shaped structure 40. The high pressure air is supplied to the high pressure air supply pipe 49 from a high pressure air supply source 100 (see FIG 4), which is high pressure air supply equipment within a factory such as a blower or other fan mechanism. The high pressure air supply pipe 49 is also equipped with an air shut-off valve 4a. The instruction to open or close the air shut-off valve 4a comes from the control device 90, described below.

(Control device)

[0040] The control device 90 is intended to control the weighing machine 2 and the opening and closing of the air shut-off valve 4a of the article transfer device 4 and also to control the form-fill-seal machine 3, and has a CPU, ROM, RAM, and other elements.
The control device 90 controls the actuated portions and the like of each of the mechanisms of the film supply unit 6 and the form-fill-seal unit 5, in accordance with an operation and/or setting inputted from an operation switch 7 and/or a touch panel display 8 illustrated in FIGS. 1 and 2. The control device 90 also controls the actuation of the feeder, the pull hopper 24, the weighing hopper 25, and other elements of the weighing machine 2. The control device 90 further takes required information from various sensors positioned on the weighing machine 2 and the form-fill-seal machine 3, and uses the information in various different controls.
[0041] The control device 90 is responsible for issuing instructions to open or close to the pull-down belt mechanism 14, vertical sealing mechanism 15, and lateral sealing mechanism 17 of the form-fill-seal unit 5, as well as to the air shut-off valve 4a of the article transfer device 4.

(Roles and features of the article transfer device for dropping articles through to the form-fill-seal machine)

(1)

[0042] The article transfer device 4 receives, from the upper end opening 40a of the funnel-shaped structure 40, a group of articles dropped in from the weighing machine 2 (see the group of articles C in FIG 3). Thereafter, as the group of articles drops through the inner space S2 of the funnel-shaped structure 40 (see the group of articles C3 in FIG 7), the group of articles falls through into the tube 13b of the form-fill-seal machine 3 from the lower end opening 40b of the funnel-shaped structure 40 (see the group of articles C3 in FIG 8). At the time the group of articles is dropping through the inner space S2 of the funnel-shaped structure 40, high pressure air is sent into the high pressure air supply space S1 of the funnel-shaped structure 40 from the high pressure air supply pipe 49, and the high pressure air present in the high pressure air supply space S1 is spouted into the inner space S2 from the plurality of air ejection holes 41c lined up in a helical shape. The bags B are continuously produced by the form-fill-seal machine 3, and an air flow that flows downward from above is also created in the inner space S2 of the article transfer device 4, which is connected to the tube 13b of the form-fill-seal machine 3. The air being spouted from the air ejection holes 41 lined up in a helical shape converges with this air flow, whereby, in the inner space S2 of the funnel-shaped structure 40, there is created a downwardly oriented, helically shaped spinning flow of air along the inner peripheral surface 40c of the funnel-shaped structure 40, as illustrated by the double-dotted lines in FIGS. 7 and 8.
[0043] Because of the helically shaped spinning air flow created in the inner space S2 of the funnel-shaped structure 40, the group of articles being dropped in from the weighing machine 2 will form a line and will fall through to the form-fill-seal machine 3 in a state where centrifugal force is being applied. The articles are thereby made to also enter the two side portions of the interior space of the tubular film Fm directly above the lower sealed part B1 in the form-fill-seal machine 3, thus reducing the amount of dead space (space in which there are no articles) in the interior space of the tubular film Fm. That is, the efficiency with which the articles are filled is improved by the creation of the helically shaped spinning flow in the inner space S2 of the funnel-shaped structure 40.
[0044] It is also possible to employ a configuration in which the spinning flow is generated in the space below the former 13a of the form-fill-seal machine 3, but at such a height position, there is almost no effect even when the spinning flow hits the group of articles, the result being that dead space still remains, without any change. By contrast, in the bag-making system of the present embodiment, which deploys the article transfer device 4 above the form-fill-seal machine 3, because the helically shaped spinning flow of air hits the group of articles at such a height position, it is possible to reduce the amount of dead space in the interior space of the tubular film Fm in a state where the group of articles is present inside.

(2)

[0045] Further, in the article transfer device 4 according to the present embodiment, the cross-sectional area of the inner space S2 gradually increases from the lower end opening 40b toward the upper end opening 40a, and the surface surrounding the inner space S2, i.e., the inner peripheral surface 40c of the inner funnel member 41 has an angle of incline set within the range of 3° to 25° relative to a vertical line. Therefore, the inner peripheral surface 40c of the inner funnel member 41 has no steeply stepped parts, and almost no damage to the articles caused when the articles collide with the inner peripheral surface 40c will occur. The reason for this is that air spouted from the air ejection holes 41c lined up in a helical shape and formed in the inner funnel member 41 will assume a helically shaped spinning flow along the inner peripheral surface 40c, and will mitigate or absorb the collision energy imparted when the articles collide with

the inner peripheral surface 40c.

[0046] The following illustrates specific experimental results relating to (1) and (2) described above.

(Examples)

<Testing Conditions>

Sample (articles): Corn chips

[0047] Capacity: 120 bpm (120 bags/min) to 130 bpm at continuous bag production

[0048] Bag size A: 152 mm wide, 200 mm tall (140 mm wide, 190 tall)

[0049] Bag size B: 152 mm wide, 178 mm tall (140 mm wide, 170 mm tall)

[0050] The parentheses in A and B are the area occupied by the articles in the bag

<Weighing machine, article transfer device, and form-fill-seal machine used>

[0051] Weighing machine: CCW-R-214W made by Ishida Co., Ltd.

[0052] Form-fill-seal machine: ATLAS made by Ishida Co., Ltd.

[0053] The aforementioned article transfer device 4 illustrated in FIGS. 4 to 6

<Testing Summary and Evaluation Criteria>

[0054] Using the previously described small bag sizes, an unfavorable amount of 5% or more of the corn chips are caught in the laterally sealed portion when the article transfer device 4 is not deployed. Under these testing conditions, the article transfer device 4 was added to the bag-making system to evaluate whether the proportion of getting caught in the laterally sealed portions (the poor sealing proportion) would fall within an acceptable range.

<Testing Results>

[0055] The poor sealing proportion dropped to 1% or lower, which is an acceptable range.

(Modification Examples)

(A)

[0056] The description of the embodiment above assumed that the air shut-off valve 4a of the article transfer device 4 is always open during the form-fill-seal process, but it is also conceivable to open and close the air shut-off valve 4a according to the timing of the lateral sealing operation of the form-fill-seal machine 3.

(B)

[0057] Also, in the embodiment described above, the high pressure air supply space S1 is formed in the funnel-shaped structure 40, between the two funnel members 41, 43, and high pressure air is supplied thereto, but a tube for supplying high pressure air may also be directly connected to the air ejection holes 41c of the inner funnel member 41, without the use of the outer funnel member 43.

[0058] **REFERENCE SIGNS LIST**

2:	Weighing machine
3:	Form-fill-seal machine
4:	Article transfer device
13:	Shaping mechanism
13a: Former 13b:	Tube
17:	Lateral sealing mechanism

40:	Funnel-shaped structure (tubular part)
40a:	Upper end opening of the funnel-shaped structure
40b:	Lower end opening of the funnel-shaped structure
40c:	Interior peripheral surface of the funnel-shaped structure (= interior peripheral surface of the inner funnel member)
41:	Inner funnel member
41c:	Air ejection holes of the inner funnel member, arrayed in a helical shape
43:	Outer funnel member
45:	Upper circular lid member
47:	Lower circular lid member
49:	High pressure air supply pipe (gaseous material outlet part)
90:	Control device
100: High pressure air supply source B:	Bag
F:	Sheet film (packaging material)
Fm:	Tubular film (tube of packaging material)
S1:	High pressure air supply space
S2:	Inner space of the funnel-shaped structure

Claims

1. An article transfer device for dropping articles into a form-fill-seal machine for sealing laterally extending portions of a tubular packaging material so as to produce a bag filled with the dropped articles, the article transfer device comprising:

a tubular part having an upper end opening adapted to receive the dropped articles and a lower end opening adapted to direct the dropped articles into the form-fill-seal machine, the tubular part defining an inner space between the upper end opening and the lower end opening; an upper part of the inner space having a greater cross-sectional area than the cross-sectional area of a lower part of the inner space, the tubular member including a plurality of holes open to the inner space, the plurality of holes arranged with respect to one another defining a helical shape pattern; and
a gaseous material outlet part providing pressurized gaseous material to the plurality of holes of the tubular part and into the inner space within the tubular part.

2. The article transfer device according to claim 1, wherein:

a cross-sectional area of the inner space of the tubular part is configured to gradually increase from the lower end opening toward the upper end opening.

3. The article transfer device according to claim 1 or 2, wherein:

an inner peripheral surface of the tubular part is configured to be inclined with respect to vertical defining an angle of inclination of between 3° and 25° relative to vertical.

4. A bag-making system, comprising:

a form-fill-seal machine for producing a bag filled with articles, the form-fill-seal machine having a former part that forms a sheet of a packaging material into a tube, and a lateral sealing part that seals laterally extending portions of the tubular packaging material with the articles being located within the packaging material; and the article transfer device according to claim 1, positioned above the former part and adapted to drop the articles toward an interior space of the tubular packaging material.

5. A bag-making system, comprising:

a form-fill-seal machine for producing a bag filled with articles, the form-fill-seal machine having a former part that forms a sheet of a packaging material into a tube, and a lateral sealing part that seals laterally extending portions of the tubular packaging material with the articles being located within the packaging material; and the article transfer device according to claim 2, positioned above the former part and adapted to drop the articles toward an interior space of the tubular packaging material.

6. A bag-making system, comprising:

a form-fill-seal machine for producing a bag filled with articles, the form-fill-seal machine having a former part that forms a sheet of a packaging material into a tube, and a lateral sealing part that seals laterally extending portions of the tubular packaging material with the articles being located within the packaging material; and the article transfer device according to claim 3, positioned above the former part and adapted to drop the articles toward an interior space of the tubular packaging material.

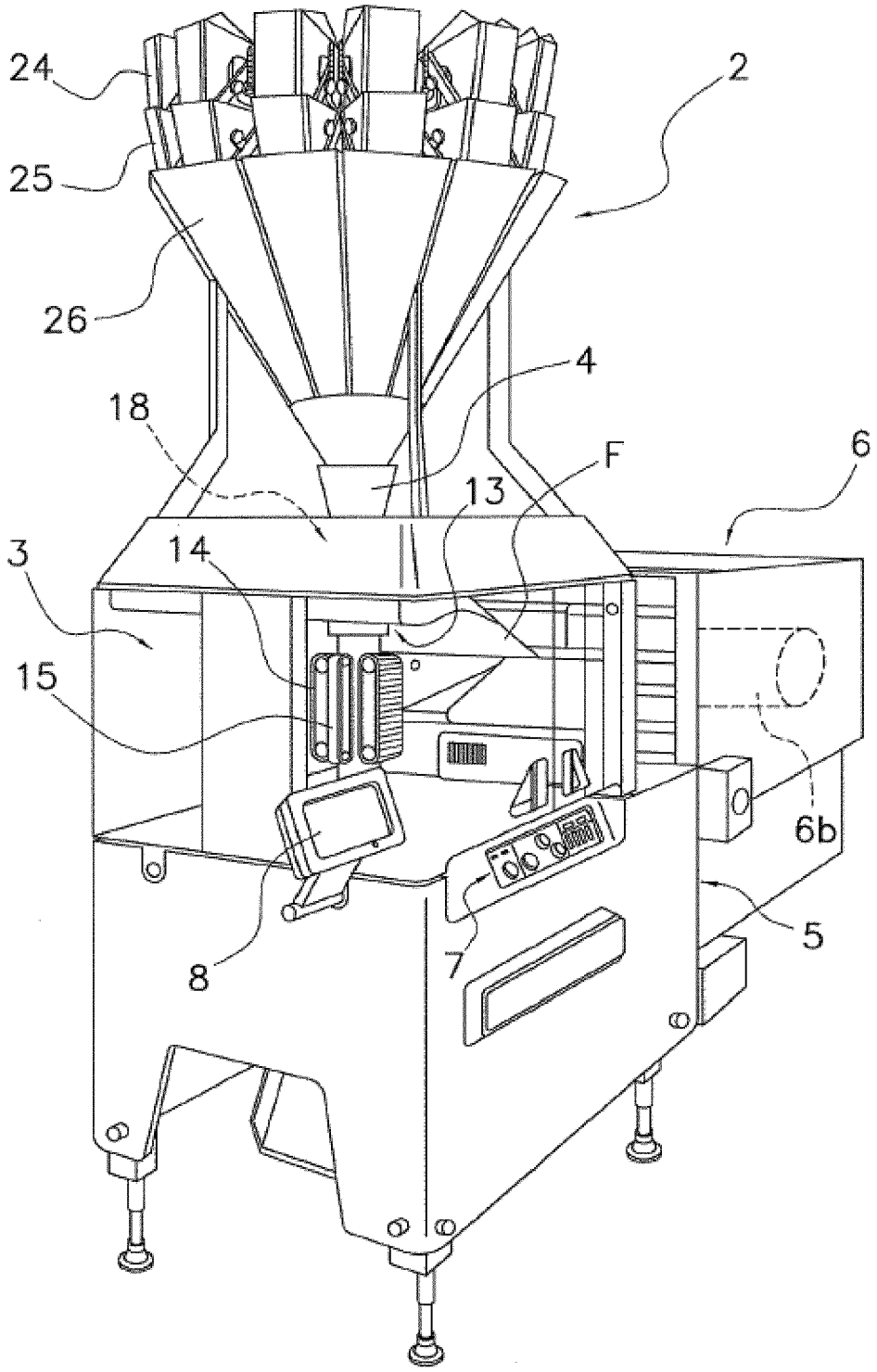

FIG. 1

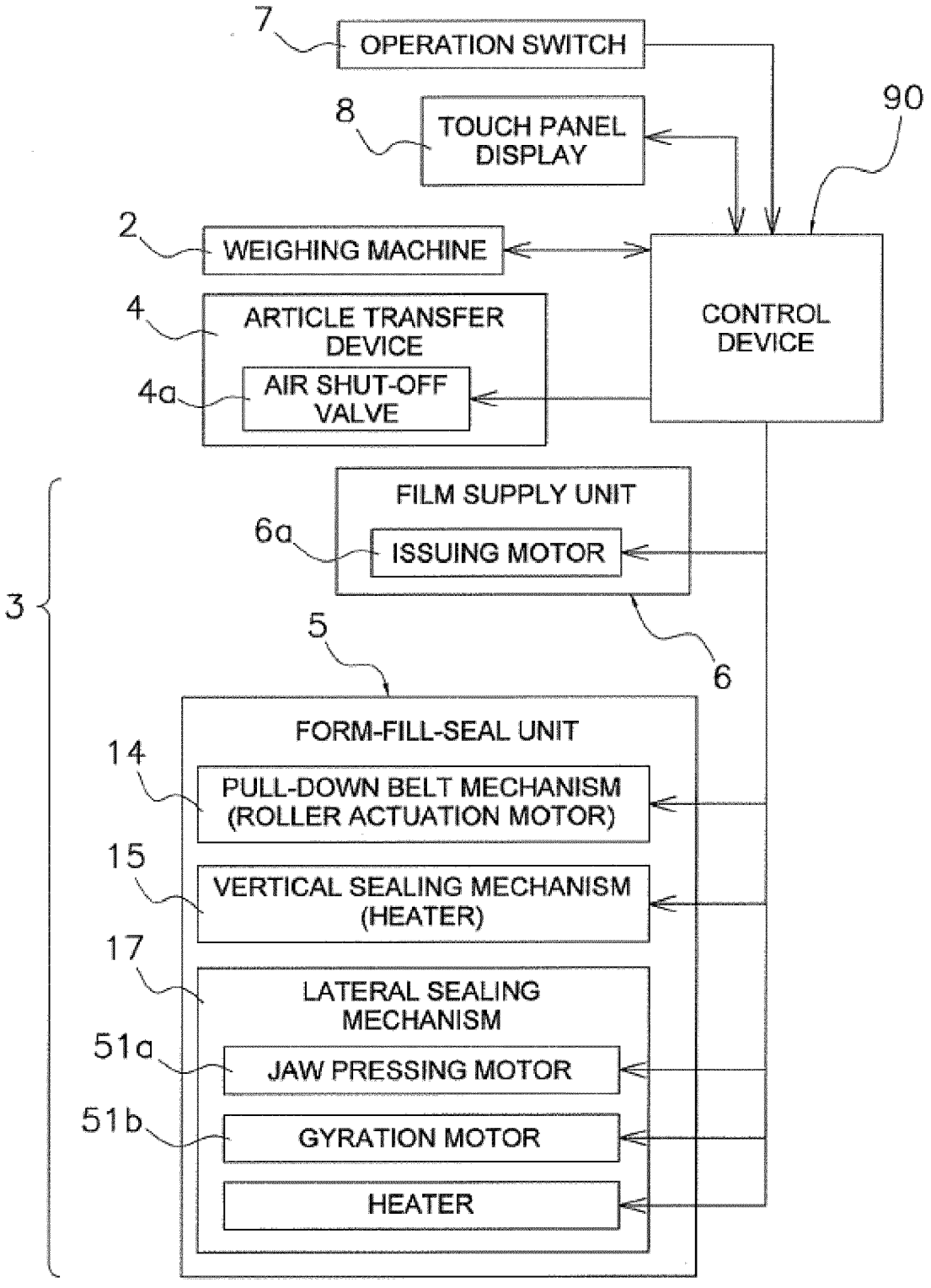
7
OPERATION SWITCH
8
TOUCH PANEL DISPLAY
90
2
WEIGHING MACHINE
4
ARTICLE TRANSFER DEVICE
4a
AIR SHUT-OFF VALVE
CONTROL DEVICE
3
FILM SUPPLY UNIT
6a
ISSUING MOTOR
6
5
FORM-FILL-SEAL UNIT
14
PULL-DOWN BELT MECHANISM (ROLLER ACTUATION MOTOR)
15
VERTICAL SEALING MECHANISM (HEATER)
17
LATERAL SEALING MECHANISM
51a
JAW PRESSING MOTOR
51b
GYRATION MOTOR
HEATER

FIG. 2

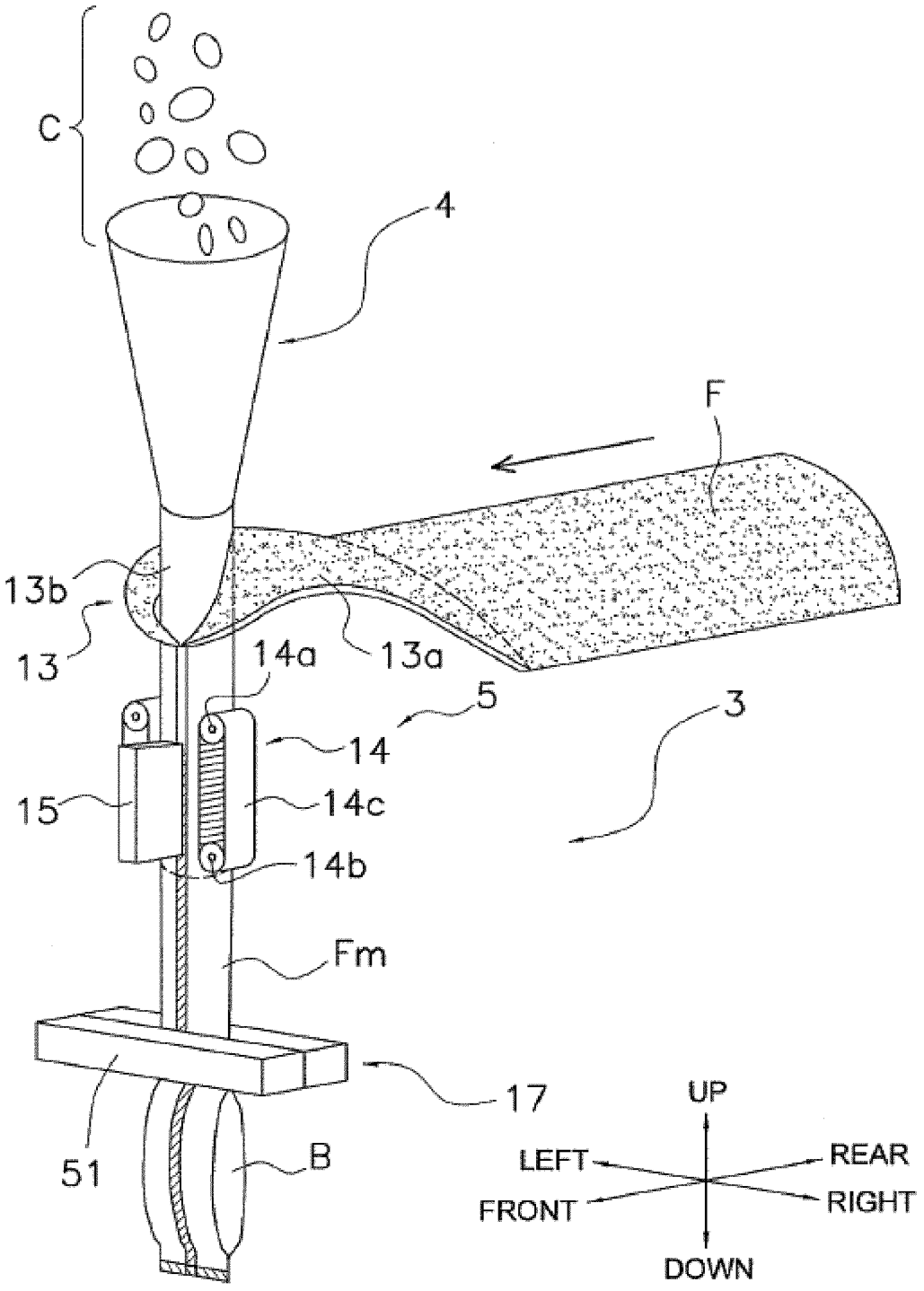
C
4
F
13b
13
13a
14a
5
14
3
15
14c
14b
Fm
17
51
B
UP
LEFT
REAR
FRONT
RIGHT
DOWN

FIG. 3

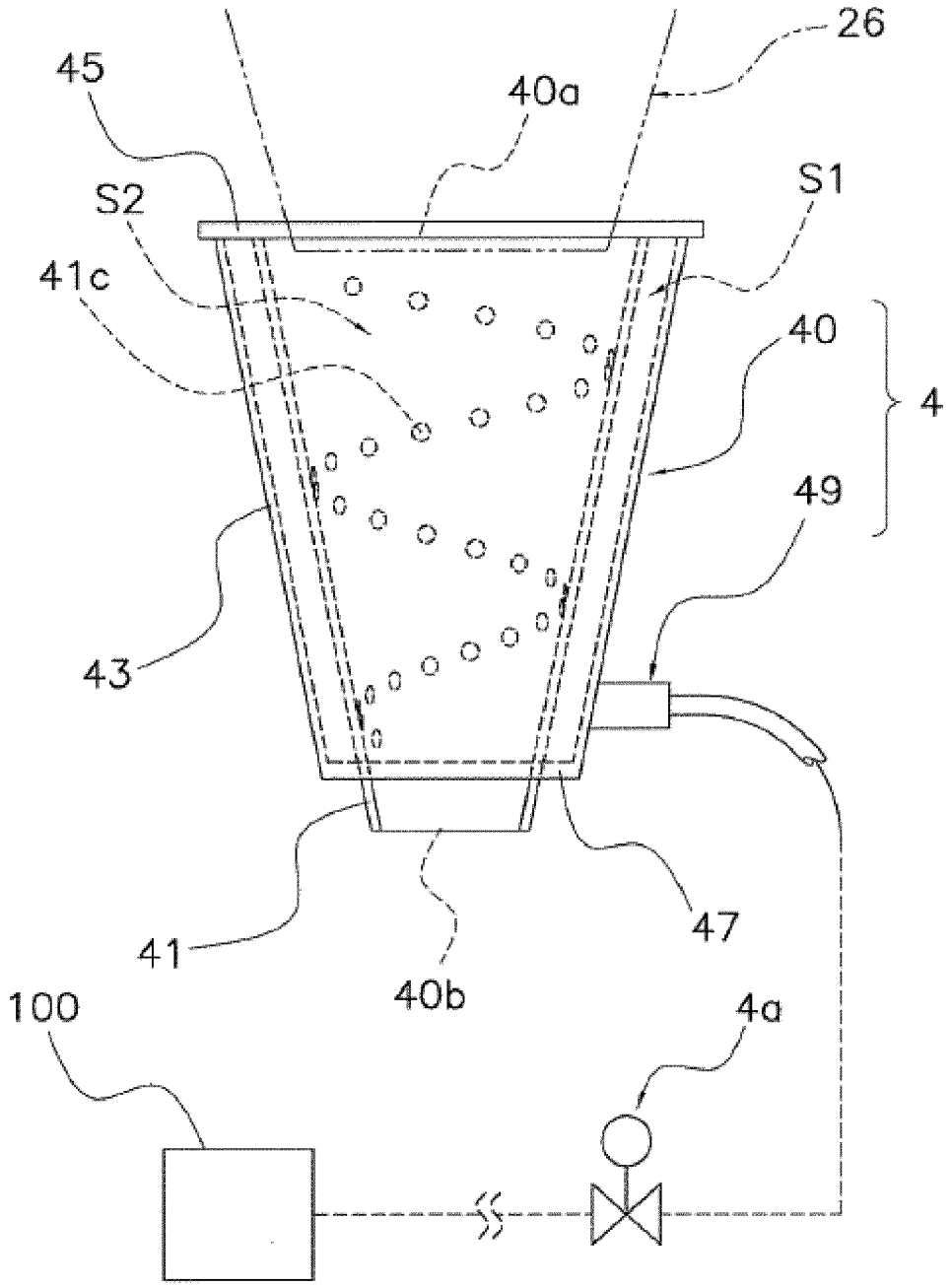

FIG. 4

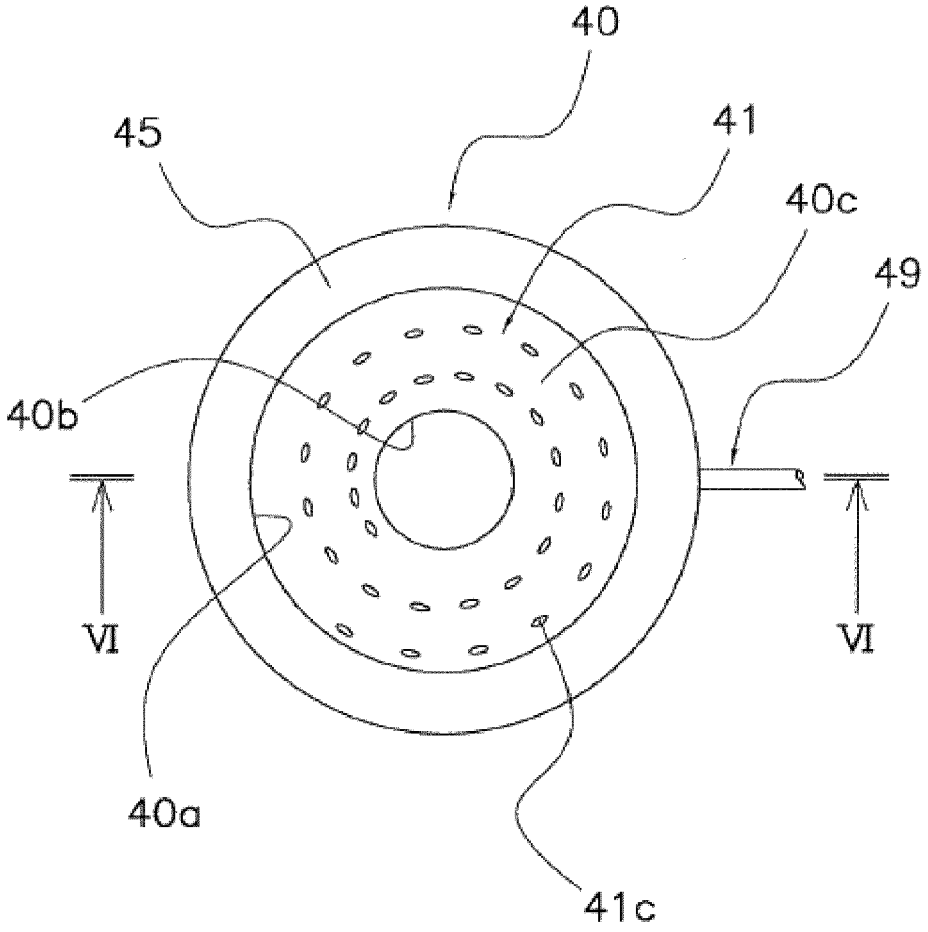

FIG. 5

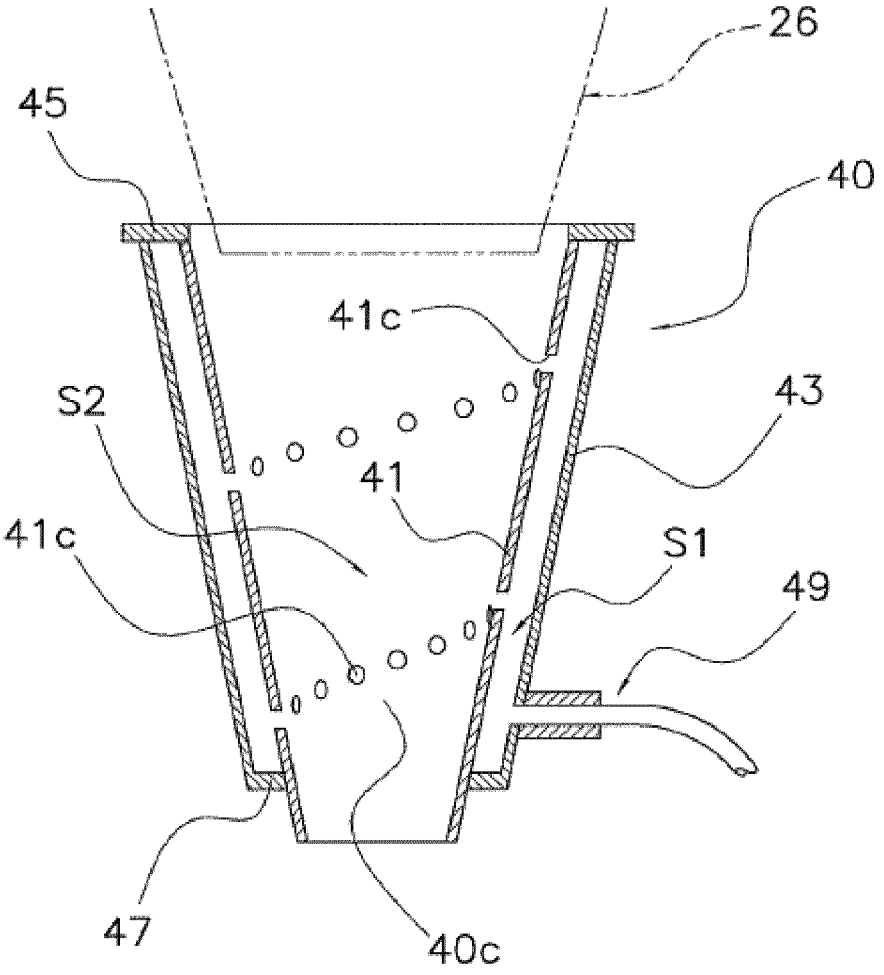

FIG. 6

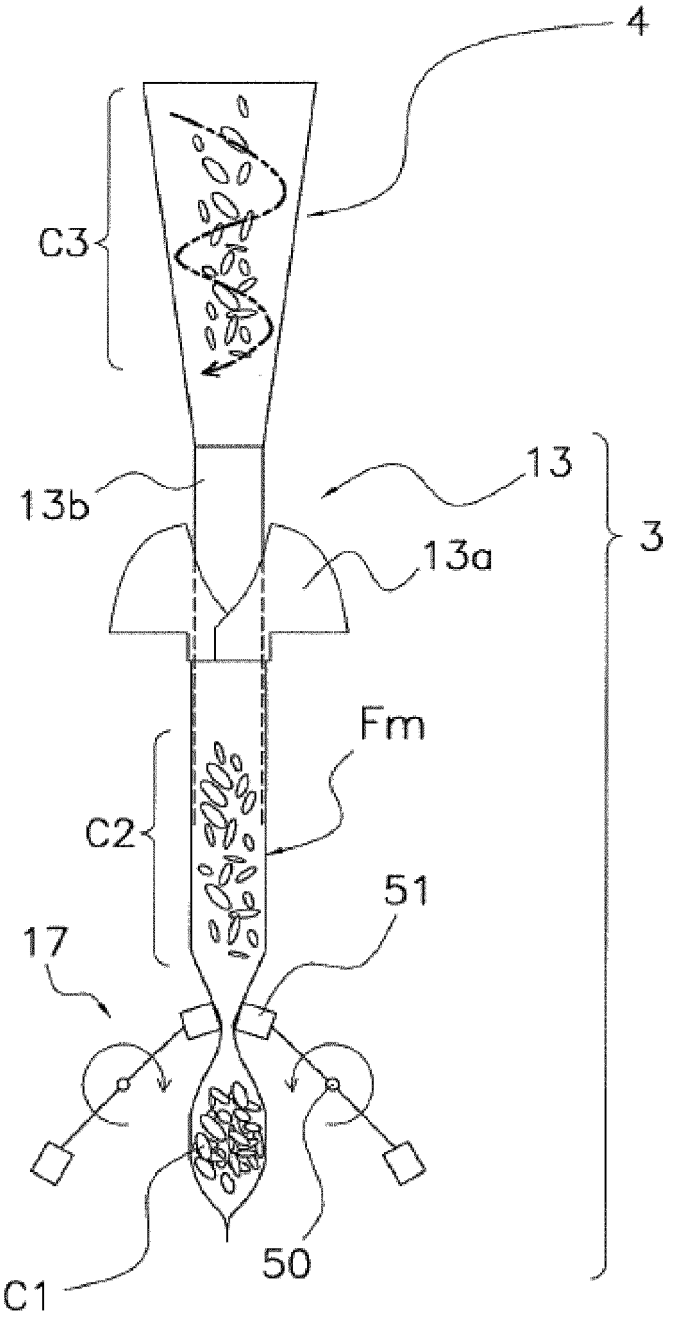

FIG. 7

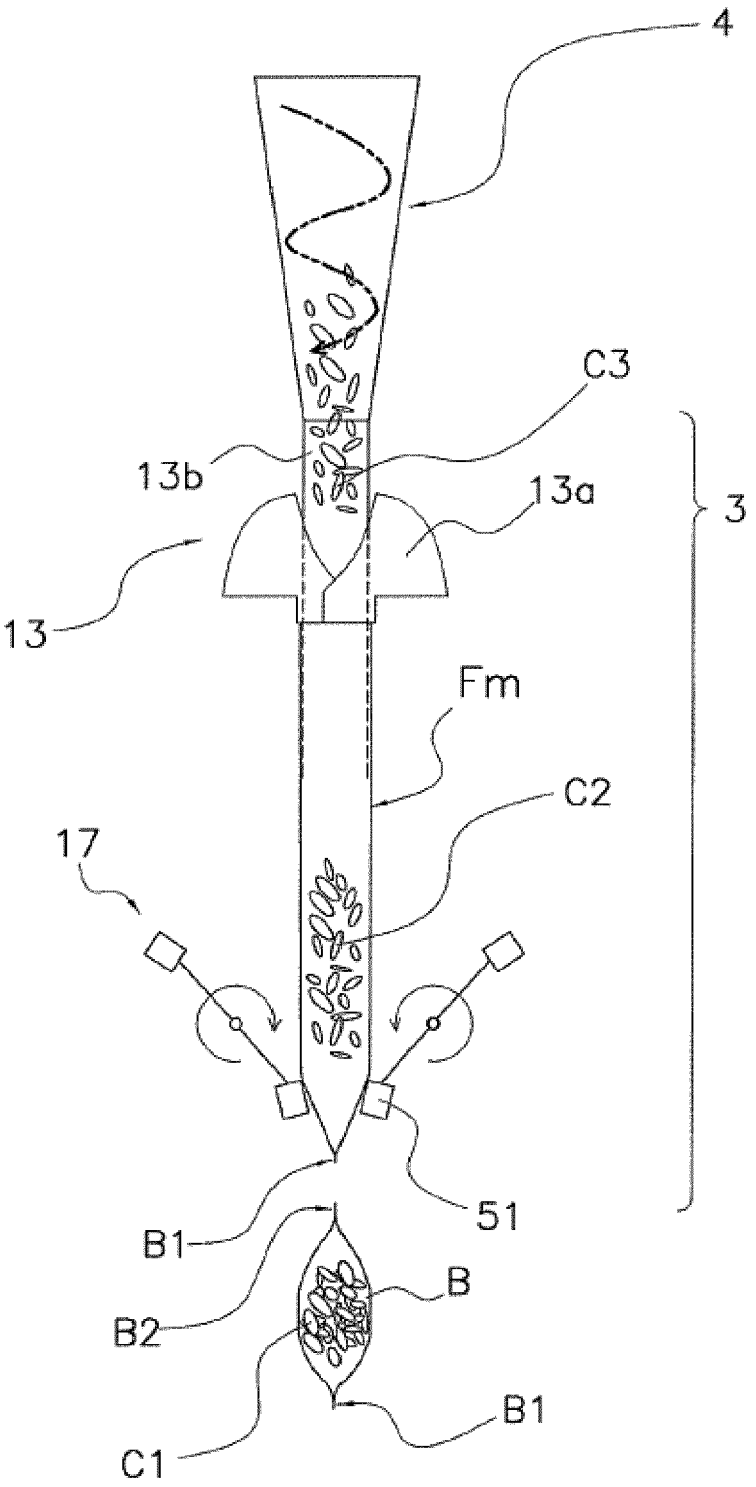

FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 61190410 A **[0003]**
- US 5881539 A **[0032]**