



**Description**

## Technical Field

**[0001]** The present invention relates to a filling device for filling containers with contents, and more particularly to a filling device for filling containers with viscous contents.

## Background Art

**[0002]** As filling devices that fill containers with viscous contents such as meat products, a filling device 110 has hitherto been known which includes a filling nozzle 120 having a nozzle hole 123 formed along an up and down direction and opened downward, contents supply means 130 for supplying contents to the nozzle hole 123, and a plunger 140 disposed inside the nozzle hole 123 such as to be movable up and down, as shown in Fig. 4 (see, for example, Patent Literature 1).

**[0003]** In this filling device 110, the contents supply means 130 supplies a constant amount of contents to the nozzle hole 123, and the plunger 140 pushes out the contents inside the nozzle hole 123 downward, to fill a container C with the contents.

**[0004]** In such a filling device 110, immediately after the container C has been filled with contents, the nozzle tip (lower end) of the filling nozzle 120 is in tight contact with the upper surface of the contents. When the nozzle tip is separated from the contents in this state, a central part of the upper surface of the contents in tight contact with the nozzle tip is pulled up, resulting in formation of a pointed peak on the upper surface of the contents.

**[0005]** The problem is that, when the container C is sealed with a lid with such a pointed peak formed on the upper surface of the contents, the pointed peak is flattened by and adhered on the back surface of the lid, which will compromise the aesthetic appearance when the container is opened. Another problem is that the contents may adhere on a container flange part C1 as a result of the peak being flattened by the lid, and may cause a defect in the seal by the lid.

**[0006]** In the filling device 110 of Patent Literature 1, in order to release the contents from the nozzle tip, an annular gas ejection port 129 is formed at the tip (lower end) of the plunger 140 as shown in Fig. 4 and gas is ejected from the gas ejection port 129 after the injection of the contents to disconnect the contact between the nozzle tip and the contents.

## Citation List

## Patent Literature

**[0007]** Patent Literature 1: Japanese Utility Model Application Laid-open No. H05-37094

## Summary of Invention

## Technical Problem

**[0008]** In the filling device 110 of Patent Literature 1, the gas ejection port 129 and gas flow passage 127 are formed in the plunger 140 that moves up and down, because of which a gas supplier 150 that supplies the gas to the gas flow passage 127 (or a connection pipe that connects the gas supplier 150 to the gas flow passage 127) also has to be moved up and down in coordination with the up and down movement of the plunger 140. As a result, the device configuration is complex, and the degree of freedom in designing the ambient environment is compromised.

**[0009]** In the filling device 110 of Patent Literature 1, to form the annular gas ejection port 129 at the tip of the plunger 140, an elaborately processed food stain prevention member 190 is attached to a recess formed at the tip of the plunger 140. Formation of the annular gas ejection port 129 at the tip of the plunger 140 thus necessitates complex processing for the tip of the plunger 140 and causes an increase in the production load.

**[0010]** Another problem that can readily occur particularly when the contents are viscous is the difficulty to fill every corner of the container C with the contents evenly without leaving gaps. Any gaps left in the filled contents may cause deterioration of the contents. Unbalanced filling of the container C may cause the contents to adhere on the container flange part C1 and be entrapped between the flange and the lid, which may damage the sealing properties.

**[0011]** Accordingly, an object of the present invention is to solve these problems and to provide a filling device that realizes simplification of device configuration, improvement of design freedom, and reduction of production loads, and that prevents formation of a pointed peak on the upper surface of packed contents, or uneven filling of the container.

## Solution to Problem

**[0012]** The present invention provides a filling device including: a filling nozzle having a nozzle hole formed along an up and down direction and opened downward; contents supply means for supplying contents to the nozzle hole; a plunger that is disposed inside the nozzle hole such as to be movable up and down and pushes out the contents supplied in the nozzle hole downward; and gas supply means for supplying a gas. The filling nozzle is formed with a gas inlet connected to the gas supply means, a gas outlet opened to the nozzle hole, and a gas flow passage connecting the gas inlet and the gas outlet. The gas supplied by the gas supply means is ejected from a gap between an inner circumferential surface of the nozzle hole and an outer circumferential surface of the plunger at a lower end of the filling nozzle. The problems noted above are thereby solved.

### Advantageous Effects of Invention

**[0013]** According to the invention as set forth in claim 1, ejection of the gas from the nozzle tip of the filling nozzle not only prevents formation of a pointed peak on the upper surface of the contents by delivering the gas in an annular form between the nozzle tip of the filling nozzle and the upper surface of the contents after the injection of the contents, thereby disconnecting the tight contact between the nozzle tip and the contents, but also provides the following effects:

Namely, according to the invention as set forth in claim 1, a gas flow passage is formed in the filling nozzle, and a gap between an inner circumferential surface of the nozzle hole and an outer circumferential surface of the plunger is utilized as a gas ejection hole from which the gas is blown out from the nozzle tip. Unlike the conventional filling device wherein a gas flow passage and a gas ejection port are formed in the plunger that moves up and down, there is no need to move a gas supplier connected to the gas flow passage, and a connection pipe or the like, up and down in coordination with the up and down movement of the plunger, so that the device configuration can be simplified, and the degree of design of the ambient environment can be improved.

**[0014]** By utilizing the gap between the inner circumferential surface of the nozzle hole and the outer circumferential surface of the plunger as the gas ejection hole, there is no need to form a separate gas ejection hole, so that the production load can be reduced.

**[0015]** Moreover, by utilizing the gap between the inner circumferential surface of the nozzle hole and the outer circumferential surface of the plunger as the gas ejection hole, even if the contents clog up the gas ejection hole, the gas ejection hole can be readily and reliably cleared without requiring any special operation, since such clogging contents can be removed by moving the plunger up and down.

**[0016]** According to the invention as set forth in claim 2, the filling nozzle includes a nozzle body, and a nozzle tip tool attached below the nozzle body. The nozzle tip tool can be replaced with a suitable one in accordance with the type of the contents and the shape of the container so as to ensure even filling of every corner of the container with the contents. Moreover, a gap between the opposite surfaces of the nozzle body and the nozzle tip tool is utilized as part of the gas flow passage and the gas outlet, so that the processing load for forming the gas flow passage and gas outlet in the filling nozzle can be reduced.

**[0017]** According to the invention as set forth in claim 3, a first packing in an annular form is provided between opposite surfaces of the nozzle body and the nozzle tip tool on an outer side of an opposite surface side opening formed in the nozzle body, so that the gas supplied from the gas supply means can be prevented from leaking out of an intended flow path and therefore can efficiently be delivered to between the contents and the lower end of

the filling nozzle. Also, by interposing the first packing between the opposite surfaces of the nozzle body and the nozzle tip tool, the gap between the opposite surfaces of the nozzle body and the nozzle tip tool, which is used as part of the gas flow passage and gas outlet, is maintained with a suitable width. At least one of the opposite surfaces of the nozzle body and the nozzle tip tool is provided with an annular recess formed annularly around the nozzle hole and communicating with the opposite surface side opening, so that the gas can be distributed in an annular form between the opposite surfaces of the nozzle body and the nozzle tip tool, which enables the gas to be ejected evenly from the annular gap between the outer circumferential surface of the plunger and the inner circumferential surface of the nozzle hole at the nozzle tip.

**[0018]** According to the invention as set forth in claim 4, a second packing in an annular form is disposed between the inner circumferential surface of the nozzle hole and the outer circumferential surface of the plunger above a contents supply hole to which the contents supply means is connected, so that the gas supplied from the gas supply means can be prevented from leaking out of an intended flow path and therefore can efficiently be delivered to between the contents and the lower end of the filling nozzle.

**[0019]** According to the invention as set forth in claim 5, a nozzle cover that is moveable along an up and down direction is provided around the filling nozzle. An outer peripheral edge on the upper surface of the contents is pressed with the nozzle cover on an outer side of the filling nozzle during the injection of the contents, to prevent the packed contents from adhering to a container flange part, and to even out the upper surface of the contents. Moreover, the gas inlet is formed above the nozzle cover when the nozzle cover is moved to an uppermost position thereof, so that interference between a connection pipe or the like connected to the gas inlet and the nozzle cover can be prevented.

**[0020]** According to the invention as set forth in claim 6, the filling nozzle includes, on a lower surface thereof, a tip protrusion formed by protruding a central part of the lower surface downward, whereby the central part of the upper surface of the contents packed in the container can be dented, so that the upper surface of the contents after heat sterilization can be evened out. Namely, when the contents are a meat product or the like, the contents undergo expansion when subjected to heat sterilization after the packing into the container. By denting the central part of the upper surface of the contents beforehand in consideration of this expansion of the contents, the upper surface of the contents after heat sterilization can be evened out.

### Brief Description of Drawings

**[0021]**

[Fig. 1] Fig. 1 is an illustrative diagram showing a filling device according to one embodiment of the present invention.

[Fig. 2] Fig. 2 is an illustrative diagram showing the flow of a gas during injection of contents.

[Fig. 3] Fig. 3 is a bottom view illustrating a filling nozzle.

[Fig. 4] Fig. 4 is a cross-sectional view illustrating a conventional filling device.

#### Reference Signs List

##### [0022]

|     |                               |
|-----|-------------------------------|
| 10  | Filling device                |
| 20  | Filling nozzle                |
| 21  | Nozzle body                   |
| 21a | Annular recess                |
| 22  | Nozzle tip tool               |
| 22a | Tip protrusion                |
| 23  | Nozzle hole                   |
| 24  | Contents supply hole          |
| 25  | Gas inlet                     |
| 26  | Gas outlet                    |
| 27  | Gas flow passage              |
| 28  | Opposite surface side opening |
| 29  | Body flow passage             |
| 30  | Contents supply means         |
| 31  | Contents supply tube          |
| 40  | Plunger                       |
| 41  | Plunger driver                |
| 50  | Gas supply means              |
| 60  | Nozzle cover                  |
| 70  | First packing                 |
| 71  | Second packing                |
| 80  | Container lifter              |
| A   | Gas                           |
| B   | Contents                      |
| C   | Container                     |
| C1  | Container flange part         |
| C2  | Container stacked part        |

#### Description of Embodiments

[0023] Below, the filling device 10 according to one embodiment of the present invention will be described with reference to the drawings.

[0024] The filling device 10 fills a container C with viscous contents B such as a meat product. As shown in Fig. 1, the device includes a filling nozzle 20 having a nozzle hole 23, contents supply means 30 for supplying the contents B to the nozzle hole 23, a plunger 40 that is disposed inside the nozzle hole 23 such as to be movable up and down and pushes out the contents B supplied to the nozzle hole 23 downward, gas supply means 50 for supplying a gas A, a nozzle cover 60 placed around the filling nozzle 20, first and second packings 70 and 71 in an annular form that seal respective parts, and a con-

tainer lifter 80 that moves the container C up and down.

[0025] The constituent elements of the filling device 10 will each be described below with reference to Fig. 1 to Fig. 3.

5 [0026] First, the filling nozzle 20 includes a cylindrical nozzle hole 23 that extends along an up and down direction and opened downward, and a contents supply hole 24 that extends sideways from the nozzle hole 23 as far as to the outer surface of the filling nozzle 20, as shown in Fig. 1 and Fig. 2. This contents supply hole 24 is connected to the contents supply means 30 to deliver the contents B into the nozzle hole 23.

10 [0027] Inside the filling nozzle 20 is formed a flow passage for a gas A supplied from the gas supply means 50 to be ejected from the nozzle tip (lower end) of the filling nozzle 20. More specifically, as shown in Fig. 1 and Fig. 2, a gas inlet 25 opened in the outer surface of the filling nozzle 20 and connected to the gas supply means 50, a gas outlet 26 opened to the nozzle hole 23, and a gas flow passage 27 that connects the gas inlet 25 and gas outlet 26, are formed inside the filling nozzle 20.

15 [0028] As shown in Fig. 2, the gas A supplied from the gas supply means 50 is forced into the nozzle hole 23 through the gas inlet 25, gas flow passage 27, an annular recess 21a, and gas outlet 26, and then, at the nozzle tip of the filling nozzle 20, blown out from an annular gap between an outer circumferential surface of the plunger 40 that has come down and an inner circumferential surface of the nozzle hole 23.

20 [0029] The filling nozzle 20 will be described in more detail: As shown in Fig. 1 and Fig. 2, the filling nozzle 20 is made up of a nozzle body 21 and a nozzle tip tool 22 fixedly attached below the nozzle body 21.

25 [0030] In the nozzle body 21 are formed, as shown in Fig. 2, the gas inlet 25 mentioned above, an opposite surface side opening 28 that opens in the opposing surface (lower surface) of the nozzle body 21 facing the upper surface of the nozzle tip tool 22, and a body flow passage 29 that connects the gas inlet 25 and the opposite surface side opening 28.

30 [0031] In this embodiment, the gas flow passage 27 is configured by the body flow passage 29, opposite surface side opening 28, and a gap between the opposite surfaces of the nozzle body 21 and the nozzle tip tool 22.

35 [0032] The gas outlet 26 mentioned above is configured by the gap between the opposite surfaces of the nozzle body 21 and the nozzle tip tool 22.

40 [0033] The nozzle hole 23 mentioned above is formed to extend over both of the upper nozzle body 21 and the lower nozzle tip tool 22, and opens in the lower surface of the nozzle tip tool 22.

45 [0034] An annular recess 21a that communicates with the opposite surface side opening 28 is formed in the opposing surface (lower surface) of the nozzle body 21. An annular recess that communicates with the opposite surface side opening 28 may also be formed likewise in the opposing surface (upper surface) of the nozzle tip tool 22.

**[0035]** With the annular recess 21a being formed at least in one of the opposing surface (lower surface) of the nozzle body 21 and the opposing surface (upper surface) of the nozzle tip tool 22, the gas A can be distributed annularly between the opposite surfaces of the nozzle body 21 and the nozzle tip tool 22, so that the gas A can be ejected uniformly from the annular gap between the outer circumferential surface of the plunger 40 and the inner circumferential surface of the nozzle hole 23 at the nozzle tip of the filling nozzle 20.

**[0036]** The nozzle tip tool 22 is formed in a substantially quadrate shape, which is similar to the shape of the container C when viewed from below as shown in Fig. 3. The nozzle tip tool 22 may be designed in a suitable shape in accordance with the shape and opening part of the container C. With the nozzle tip tool 22 having a similar shape as that of the container C like this, the contents B can be distributed to all corners of the container C, using the nozzle tip tool 22 as a pressing plate, so that the container C can be filled with the viscous contents B without leaving gaps particularly in corners at the bottom of the container C.

**[0037]** The nozzle tip tool 22 (filling nozzle 20) has, on the lower surface thereof, a tip protrusion 22a formed by protruding a central part of the lower surface downward, as shown in Fig. 1 to Fig. 3. With this tip protrusion 22a, the surface of the contents B is intentionally dented as it is being packed, so that the surface of the contents B can be made flat even when the viscous contents B expand later inside the retort container.

**[0038]** The contents supply means 30 supplies a constant amount of contents B to the nozzle hole 23, and is configured by a measuring device, cylinder, and the like. The contents supply means 30 is connected to the contents supply hole 24 of the filling nozzle 20 via a contents supply tube 31 attached to the filling nozzle 20, as shown in Fig. 1.

**[0039]** The plunger 40 is a substantially columnar member that moves up and down by a plunger driver 41 made up of an air cylinder and the like as shown in Fig. 1. When moved down, at the lowermost position, the lower surface of the plunger 40 becomes substantially flush with the lower surface of the tip protrusion 22a of the nozzle tip tool 22 as shown in Fig. 2.

**[0040]** The gas supply means 50 supplies the gas A. In this embodiment, it is made up of an air compressor that includes a regulator for regulating the amount of compressed air to be supplied, a filter that purifies the air supplied from the air compressor, and the like. The gas supply means 50 may be embodied in any specific form as long as a gas A such as air can be supplied.

**[0041]** The nozzle cover 60 is provided such as to be movable in the up and down direction relative to the filling nozzle 20 and to make contact with a container stacked part C2 for pressing the outer peripheral edge on the upper surface of the contents B on the outer side of the filling nozzle 20 during the injection of the contents B, to prevent the packed contents B from adhering to the con-

tainer flange part, and to even out the upper surface of the contents. The nozzle cover 60 is biased downward with a spring (not shown). When the nozzle cover 60 is at the lowermost position, the lower surface of the nozzle cover 60 becomes substantially flush with the lower surface in the outer peripheral part of the tip protrusion 22a of the nozzle tip tool 22 as shown in Fig. 2.

**[0042]** The first packing 70 is disposed between the opposite surfaces of the nozzle body 21 and the nozzle tip tool 22 on the outer side of the opposite surface side opening 28 as shown in Fig. 1 and Fig. 2. More specifically, the first packing 70 is disposed inside the annular recess formed in the opposing surface (upper surface) of the nozzle tip tool 22. This way, the gas A is prevented from leaking outward of the filling nozzle 20 and controlled to flow only in the direction toward the gas outlet 26.

**[0043]** The second packing 71 is disposed between an inner circumferential surface of the nozzle hole 23 and an outer circumferential surface of the plunger 40 above the contents supply hole 24 as shown in Fig. 1 and Fig. 2. More specifically, the second packing 71 is disposed inside an annular recess formed in the outer circumferential surface of the plunger 40. This way, the gas A is prevented from leaking upward of the plunger 40 and controlled to flow only in the direction toward the filling nozzle 20.

**[0044]** The container lifter 80 moves up and down to move the container C below the filling nozzle 20 in accordance with the process of injecting the contents B. While the filling nozzle 20 is installed stationary in this embodiment, the filling nozzle 20 may be provided with a mechanism that moves the nozzle up and down. Alternatively, a mechanism may be provided that moves both the filling nozzle 20 and the container C up and down. The moving speed of the container lifter 80 or the filling nozzle 20 is synchronized with the injection speed of the contents B this way, so that the contents B can reach every corner of the container C, as well as that, even when the contents B have thick viscous properties or contain flake-like solids, formation of gaps in the contents can be prevented.

**[0045]** Next, a method of filling the container C with the contents B using the filling device 10 will be described below.

**[0046]** First, the container C is moved up by the container lifter 80, to bring the nozzle cover 60 around the filling nozzle 20 into contact with the container stacked part C2 of the container C, and to insert the nozzle tip tool 22 of the filling nozzle 20 into the container C as far as near the lower end.

**[0047]** At this time, the nozzle cover 60 is pushed up by the container stacked part C2 and moves up.

**[0048]** Next, with the container lifter 80 being stopped, the contents B start to be supplied from the contents supply means 30 into the nozzle hole 23 via the contents supply hole 24. After every corner in the bottom of the container C is filled with the contents B without gaps (after about 10 seconds), the container lifter 80 starts to move

down the container C, while the supply of the contents B is continued. The time during which the container lifter 80 is at halt and the lowering distance of the container lifter 80 may be adjusted suitably in accordance with the speed of filling the container C with the contents B. When the outer peripheral edge of the nozzle tip tool 22 is substantially flush with the nozzle cover 60, the supply of the contents B is stopped. After the container lifter 80 is lowered further several mm (about 3 mm in this embodiment), the plunger 40 is moved down, to push the contents B inside the nozzle hole 23 into the container C, whereupon the filling is complete. The timing of lowering the container lifter 80 is divided into several stages and adjusted in this way, so that uneven filling of the container C or formation of gaps in the contents B can be prevented more reliably.

**[0049]** When the filling is complete, the contents B in the container C are in tight contact with the lower surface of the filling nozzle 20 (nozzle tip tool 22) as shown in Fig. 2, which means a vacuum is produced between the upper surface of the contents B and the lower surface of the filling nozzle 20.

**[0050]** Accordingly, the gas A is then supplied from the gas supply means 50. The gas A is supplied through the gas inlet 25, gas flow passage 27, gas outlet 26, annular recess 21a, and an annular gap between the outer circumferential surface of the plunger 40 and the inner circumferential surface of the nozzle hole 23 as shown in Fig. 2, and delivered to between the upper surface of the contents B and the lower surface of the filling nozzle 20. This way, the vacuum between the upper surface of the contents B and the lower surface of the filling nozzle 20 is removed, so that the upper surface of the contents B and the lower surface of the filling nozzle 20 no longer make tight contact with each other. Therefore, when the filling nozzle 20 is separated from the container C after the injection of the contents B, formation of a pointed peak, which is created by the pulling up of the upper surface of the contents B by the filling nozzle 20, can be prevented.

**[0051]** Lastly, the container C filled with the contents B is moved down.

**[0052]** While one embodiment of the present invention has been described in detail above, the present invention is not limited to the embodiment described above, and various design changes can be made without departing from the scope of the present invention set forth in the claims.

**[0053]** For example, while the filling nozzle is made up of a nozzle body and a nozzle tip tool in the embodiment described above, the filling nozzle may be configured as a single component.

## Claims

1. A filling device comprising: a filling nozzle having a nozzle hole formed along an up and down direction

and opened downward; contents supply means for supplying contents to the nozzle hole; a plunger that is disposed inside the nozzle hole such as to be movable up and down and pushes out the contents supplied in the nozzle hole downward; and gas supply means for supplying a gas, the filling nozzle being formed with a gas inlet connected to the gas supply means, a gas outlet opened to the nozzle hole, and a gas flow passage connecting the gas inlet and the gas outlet, a gas supplied by the gas supply means being ejected from a gap between an inner circumferential surface of the nozzle hole and an outer circumferential surface of the plunger at a lower end of the filling nozzle.

2. The filling device according to claim 1, wherein the filling nozzle includes a nozzle body, and a nozzle tip tool attached below the nozzle body, and a gap between opposite surfaces of the nozzle body and the nozzle tip tool serves as part of the gas flow passage and the gas outlet.

3. The filling device according to claim 2, wherein the nozzle body is formed with the gas inlet, an opposite surface side opening that opens in the opposite surface of the nozzle body, and a body flow passage that connects the gas inlet and the opposite surface side opening, at least one of the opposite surfaces of the nozzle body and the nozzle tip tool is provided with an annular recess formed annularly around the nozzle hole and communicating with the opposite surface side opening, and a first packing in an annular form is provided between the opposite surfaces of the nozzle body and the nozzle tip tool on an outer side of the opposite surface side opening.

4. The filling device according to any one of claims 1 to 3, wherein the filling nozzle is formed with a contents supply hole to which the contents supply means is connected, the contents supply hole extends sideways from the nozzle hole and reaches an outer surface of the filling nozzle, and a second packing in an annular form is disposed between the inner circumferential surface of the nozzle hole and the outer circumferential surface of the plunger above the contents supply hole.

5. The filling device according to any one of claims 1 to 4, further comprising a nozzle cover placed around the filling nozzle, wherein the nozzle cover is provided such as to be movable up and down relative to the filling nozzle, and the gas inlet is formed above the nozzle cover when the nozzle cover is moved to an uppermost position

thereof.

6. The filling device according to any one of claims 1 to 5, wherein the filling nozzle includes, on a lower surface thereof, a tip protrusion formed by protruding a central part of the lower surface downward. 5

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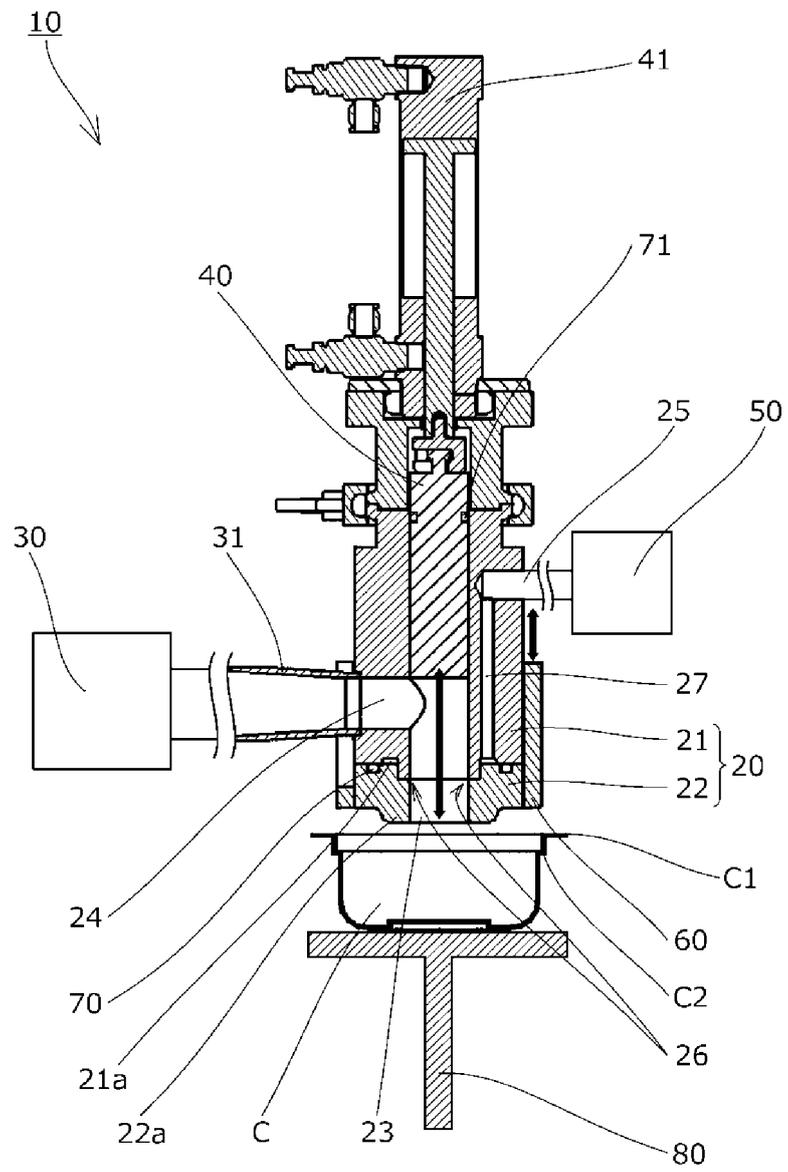


FIG. 1



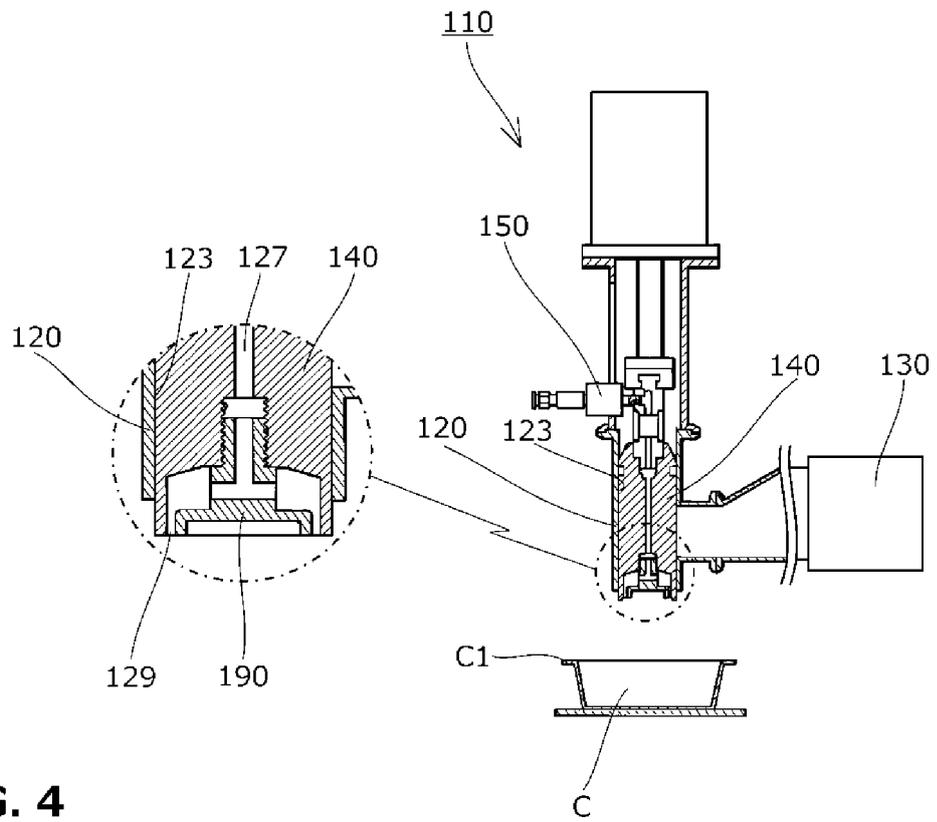


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.  
PCT/JP2016/078840

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A. CLASSIFICATION OF SUBJECT MATTER  
B65B3/32(2006.01) i

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

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
B65B3/32, B67C3/02

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

|                           |           |                            |           |
|---------------------------|-----------|----------------------------|-----------|
| Jitsuyo Shinan Koho       | 1922-1996 | Jitsuyo Shinan Toroku Koho | 1996-2016 |
| Kokai Jitsuyo Shinan Koho | 1971-2016 | Toroku Jitsuyo Shinan Koho | 1994-2016 |

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

25

| Category* | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|-----------|---|-----------------------|
| X         | JP 2004-210315 A (Nisshin Foods Inc.),  | 1-2                   |
| Y         | 29 July 2004 (29.07.2004),  | 4-6                   |
| A         | paragraphs [0009] to [0011]; fig. 1 to 5<br>(Family: none)                          | 3                     |
| Y         | US 3926229 A (SCHOLLE, William R.),   | 4-6                   |
| A         | 16 December 1975 (16.12.1975),<br>column 2, lines 3 to 59; drawings<br>& PH 13048 A | 3                     |

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

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\* Special categories of cited documents:

|   |  |
|---|--|
| "A" document defining the general state of the art which is not considered to be of particular relevance  | "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  |
| "E" earlier application or patent but published on or after the international filing date   | "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   |
| "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) | "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 |
| "O" document referring to an oral disclosure, use, exhibition or other means  | "&" document member of the same patent family  |
| "P" document published prior to the international filing date but later than the priority date claimed  |  |

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| Date of the actual completion of the international search<br>07 November 2016 (07.11.16) | Date of mailing of the international search report<br>22 November 2016 (22.11.16) |
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| Name and mailing address of the ISA/<br>Japan Patent Office<br>3-4-3, Kasumigaseki, Chiyoda-ku,<br>Tokyo 100-8915, Japan | Authorized officer<br><br>Telephone No. |
|--|---|

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/078840

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| C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |  |                       |
|---|--|-----------------------|
| Category*   | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
| Y   | Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 080772/1981 (Laid-open No. 193607/1982)<br>(Kao Soap Co., Ltd.),<br>08 December 1982 (08.12.1982),<br>claims; fig. 1 to 4<br>(Family: none) | 5-6                   |
| Y   | JP 2014-181057 A (Toyo Seikan Kaisha, Ltd.),<br>29 September 2014 (29.09.2014),<br>paragraphs [0004], [0013]; fig. 2 to 3<br>(Family: none)  | 5-6                   |
| Y   | JP 62-15401 B2 (Yoshino Kogyosho Co., Ltd.),<br>07 April 1987 (07.04.1987),<br>column 5, line 42 to column 6, line 13; fig. 1 to 2<br>(Family: none)   | 6                     |

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Form PCT/ISA/210 (continuation of second sheet) (January 2015)

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP H0537094 B [0007]