



(11)

EP 4 317 008 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.02.2024 Bulletin 2024/06

(51) International Patent Classification (IPC):
B65D 41/34 (2006.01)

(21) Application number: **22780065.3**

(52) Cooperative Patent Classification (CPC):
B65D 41/34

(22) Date of filing: **15.03.2022**

(86) International application number:
PCT/JP2022/011522

(87) International publication number:
WO 2022/209844 (06.10.2022 Gazette 2022/40)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Nippon Closures Co., Ltd.**
Tokyo 141-0022 (JP)

(72) Inventor: **OOKA, Shinji**
Hiratsuka-shi, Kanagawa 254-0021 (JP)

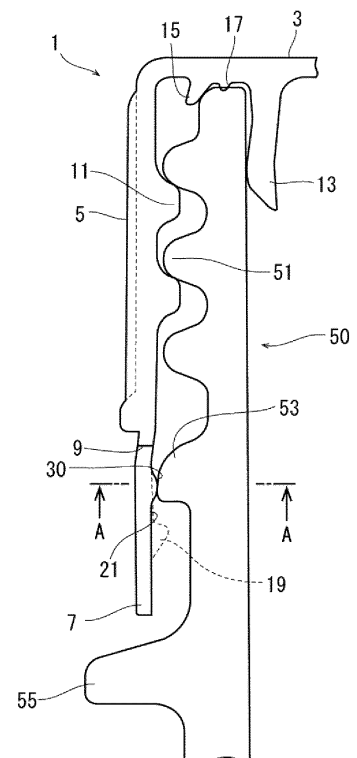
(74) Representative: **Müller-Boré & Partner**
Patentanwälte PartG mbB
Friedenheimer Brücke 21
80639 München (DE)

(30) Priority: **30.03.2021 JP 2021056636**

(54) **PLASTIC SCREW CAP HAVING EXCELLENT WASHABILITY**

(57) There is provided a plastic screw cap with a tamper-evident band that ensures improved removal of washing water. A plastic screw cap (1) includes: a top plate (3); a skirt wall (5); and a TE band (tamper-evident band) that is connected to a lower end of the skirt wall (5) via a breakable bridge and includes on its inner surface a locking projection (19) capable of being locked to a lower surface of a container jaw portion (53). The TE band (7) includes on its inner surface a flow path forming projection (30) that is located above the locking projection (19) and abuts an outer surface of the container jaw portion (53) to form a flow path between the container jaw portion (53) and an inner surface of the skirt wall (5).

Fig. 1



EP 4 317 008 A1

Description

Technical Field:

[0001] The present invention relates to a plastic screw cap. More specifically, the present invention relates to a plastic screw cap with good washability.

Background Art:

[0002] Plastic screw caps have a top plate and a skirt wall extending downward from the peripheral edge of the top plate. The skirt wall includes on its inner surface a thread (internal thread) to be engaged with a thread (external thread) provided on the outer surface of a container mouth portion. At the lower end of the skirt wall, a tamper-evident band (TE band) is provided via a breakable bridge. The TE band includes on its inner surface a locking projection capable of being locked to the lower surface of a container jaw portion. When the cap is rotated in the opening direction, the skirt wall of the cap is allowed to ascend along the outer surface of the container mouth portion, while the TE band is restricted in its ascending movement because the locking projection is locked to the lower surface of the container jaw portion. Then, as the cap continues to be rotated in the opening direction, the bridge connecting the skirt wall and the TE band of the cap is disconnected. Thus, the TE band is separated from the cap removed from the container mouth portion. In other words, if the TE band is separated from the cap, it is an indication that the cap has been opened and removed from the mouth portion of the container. As such, the TE band serves as a tamper resistant function and ensures the quality of the contents of the container.

[0003] Meanwhile, screw caps with a TE band as described above have a problem with its washability, which needs to be improved.

[0004] More specifically, before a screw cap is attached to a container, it is washed with water or the like, followed by drying by air blow so that the washing water in the cap is removed. The problem is that the washing water remaining in the cap is pooled on the upper surface of the container jaw portion. The washing water pooled on the upper surface of the container jaw portion gradually flows out to the outer surface of the TE band through a minute void between the skirt wall and the TE band of the cap. As a result, the print and the like on the outer surface of the TE band is blurred. The problem with the removal of washing water tends to be pronounced when filling and capping of the container is done on high-speed lines. This is presumably because the washed cap is often not fully dried before being attached to the container.

[0005] Usually, the water pooled on the upper surface of the jaw portion of the container sealed with the cap is removed by air blow through the minute void between the skirt wall and the TE band of the cap attached to the container. However, the locking projection formed at a lower part of the TE band to be locked to the lower surface

of the container jaw portion hinders the flow of the washing water pooled on the upper surface of the container jaw portion, making it difficult to remove the water by air blow. In particular, the water removal tends to be much more difficult in recently proposed caps that take measures to prevent the TE band from slipping out when the caps are opened and removed from the container mouth portion. For example, Patent Document 1 proposes a screw cap including an annular inclined surface with an inverted truncated cone shape that is formed on the upper side of the locking projection on the inner surface of the TE band. When this cap is being opened, the annular inclined surface comes into close contact with the outer peripheral surface of the container jaw portion, whereby the TE band is prevented from slipping out. With this structure, the washing water pooled on the upper surface of the container jaw portion is much more difficult to discharge.

[0006] In order to allow the washing water pooled on the upper surface of the container jaw portion to flow down easily, Patent Document 2 proposes a cap in which the TE band includes on its inner surface a plurality of axially extending grooves that are located above the locking projection to be locked to the lower surface of the container jaw portion. However, since these grooves are formed on the inner surface of the TE band, they are restricted in depth, resulting in insufficient removal of the washing water. As a result, the print is still sometimes blurred by the washing water in the case of high-speed filling, for example.

Prior Art Documents:

Patent Documents:

[0007]

Patent Document 1: JP-B2-6393497

Patent Document 2: JP-B2-6373099

Summary of the Invention:

Problems to be solved by the invention:

[0008] Therefore, an object of the present invention is to provide a plastic screw cap with a tamper-evident band that has improved washability so that less washing water remains.

Means for solving the problems:

[0009] The present invention provides a plastic screw cap including: a top plate; a skirt wall that extends downward from a peripheral edge of the top plate and includes on its inner surface a thread to be screwed to an outer surface of a container mouth portion; and a tamper-evident band that is connected to a lower end of the skirt wall via a breakable bridge and includes on its inner sur-

face a locking projection capable of being locked to a lower surface of a container jaw portion. The tamper-evident band further includes on its inner surface a flow path forming projection that is located above the locking projection and abuts an outer surface of the container jaw portion to form a flow path between the container jaw portion and an inner surface of the skirt wall.

[0010] It is suitable for the plastic screw cap of the present invention that:

(1) in a region continuing to an upper surface of the locking projection, an annular inclined surface or a circumferentially intermittent arc-shaped inclined surface is formed such that it becomes gradually thicker from top toward an upper end joint of the locking projection, and the flow path forming projection is disposed above the annular inclined surface or the arc-shaped inclined surface;

(2) a plurality of the locking projections are formed at regular intervals in a circumferential direction, and the flow path forming projection is disposed between and above each pair of adjacent two locking projections; and

(3) the flow path forming projection has an axially extending rib shape or a block shape.

Effects of the Invention:

[0011] A novel feature of the cap of the present invention is that a TE band includes on its inner surface a flow path forming projection that is located above a locking projection to be locked to the lower surface of a container jaw portion. In a state where the cap is attached to a container mouth portion, the flow path forming projection abuts the outer surface of the jaw portion of the container, allowing a space to be formed around the flow path forming projection between the TE band and the container jaw portion. Further, in this state, the locking projection is kept away from the lower surface of the container jaw portion, while it serves to restrict the ascending movement of the cap by being locked to the lower surface of the container jaw portion when the cap is being opened. In other words, the space formed between the TE band and the container jaw portion by the flow path forming projection is not enclosed by the locking projection but is connected to the outer space. This enables the space formed around the flow path forming projection to serve as a flow path for discharging a washing fluid. Thus, the washing fluid pooled on the upper surface of the container jaw portion can be discharged to the outside through the space formed between the flow path forming projection and the container jaw portion by air blow through a void formed between the TE band and a skirt wall.

[0012] In this manner, the cap of the present invention exhibits excellent washability (water removal), thereby effectively preventing the print on the outer surface of the TE band from being blurred, for example, by the washing fluid pooled in the cap.

[0013] As in Patent Document 2, if the TE band includes axially extending grooves intended to function as flow paths, such grooves need to be wide and deep, which causes a significant reduction in the strength of the TE band. As a result, the TE band becomes so deformable that the locking projection inconveniently climbs over the container jaw portion when the cap is being opened. To avoid this, the width and depth of the grooves are so restricted that they do not fully function as flow paths for discharging the washing fluid. However, the cap of the present invention employs the projection, rather than grooves, to form the flow path, thereby ensuring water removal without causing the aforementioned inconvenience even when it is handled by a high-speed filling capping machine, for example.

Brief Description of the Drawings:

[0014]

[Fig. 1]: a partial vertical cross-sectional view showing a plastic cap of the present invention and a container mouth portion;

[Fig. 2]: a view showing an A-A cross section in Fig. 1;

[Fig. 3]: views for explaining the function of a flow path forming projection in the present invention;

[Fig. 4]: a partial exploded view of a TE band in the plastic cap of the present invention; and

[Fig. 5]: a view showing an example of another embodiment of the flow path forming projection in the present invention.

Mode for Carrying out the Invention:

[0015] Referring to Fig. 1, a plastic screw cap (hereinafter, may be referred to simply as a cap) of the present invention is denoted as a whole by reference numeral 1. The cap 1 is screwed and attached to a container mouth portion 50. On the outer surface of the container mouth portion 50, a thread (external screw) 51 is formed. A jaw portion (bead) 53 with a larger diameter than the thread 51 is formed below the thread 51. A support ring 55 with a much larger diameter is formed on the lower side of the jaw portion 53 for the purpose of portability, positioning and the like.

[0016] The cap 1 has a top plate 3 and a skirt wall 5 extending downward from the peripheral edge of the top plate 3. The lower end of the skirt wall 5 is connected with a TE band (tamper-evident band) 7 via a plurality of breakable bridges (not shown in the drawing). A slit 9, which is a minute void, is formed between the lower end of the skirt wall 5 and the upper end of the TE band 7.

[0017] The skirt wall 50 includes on its inner surface a thread (internal screw) 11 to be screwed to the thread 51 provided in the container mouth portion 50.

[0018] On the inner surface of the top plate 3, an inner ring 13 is provided to extend downward away from the skirt wall 5. On the outer side of the inner ring 13, a short

auxiliary projection 15 inclined outward is formed circumferentially. Between the inner ring 13 and the auxiliary projection 15, a small flat projection 17 is formed circumferentially.

[0019] On the inner surface of the TE band 7, a hooked locking projection 19 is formed.

[0020] With this structure, when the cap 1 placed on the container mouth portion 50 is rotated in the closing direction, the cap is allowed to descend as the thread 11 of the cap 1 and the thread 51 of the container mouth portion 50 are screwed together. Accordingly, the upper end of the container mouth portion 50 is inserted into the space between the inner ring 13 and the auxiliary projection 15 formed on the inner surface of the top plate 3 until the upper end surface of the container mouth portion 50 abuts the flat surface of the small flat projection 17, whereby the container mouth portion 50 is sealed. At this time, the locking projection 19 of the TE band 7 climbs over the jaw portion 53 and is located on the lower side of the jaw portion 53.

[0021] On the upper side of the locking projection 19 provided on the inner surface of the TE band 7, an inclined surface 21 is formed such that it becomes gradually thicker from top to bottom toward the upper end joint of the locking projection 19. The inclined surface 21 is detailed in Patent Document 1, for example.

[0022] When the cap 1 in a closed state is rotated in the opening direction, the skirt wall 5 is allowed to ascend as the thread 11 and the thread 51 are unscrewed, while the TE band 7 is restricted in its ascending movement because the ascending locking projection 19 is locked to the lower surface of the jaw portion 53. As a result, stress is concentrated in the breakable bridges (not shown in the drawing) connecting the skirt wall 5 and the TE band 7, allowing the bridges to be broken. Thus, the TE band 7 is separated from the skirt wall 5. At this time, if the TE band 7 ascends sharply in response to the rotation in the opening direction, the locking projection 19 may climb over the jaw portion 23, causing the TE band 7 still connected to the skirt wall 5 to slip out of the container mouth portion 50. To avoid this, the inclined surface 21 is formed, so that the TE band 7 is allowed to ascend gradually until the locking projection 19 is locked to the jaw portion 53. Thus, the TE band 7 is effectively prevented from slipping out.

[0023] As such, if the TE band 7 is separated from the cap 1 removed from the container mouth portion 50, it is a clear indication that the cap has been opened.

[0024] According to the cap 1 with the TE band 7 in the present invention, the TE band 7 includes on its inner surface a flow path forming projection 30 that is provided on the upper side of the locking projection 19, as shown in Fig. 1. The flow path forming projection 30 is provided such that it is located to face and abut the jaw portion 53.

[0025] As shown in Fig. 2 (showing an A-A cross section in Fig. 1), a space X is formed between the inner surface of the TE band 7 and the outer surface of the jaw portion 53 around the flow path forming projection 30.

[0026] Referring to Fig. 3, the function of the flow path forming projection 30 will be explained. In a conventional cap without the flow path forming projection 30 as shown in Fig. 3(a), the inner surface of the TE band 7 is in contact with the outer surface of the jaw portion 53. With this structure, even when air is blown through the slit 9 to a liquid droplet Y of washing water, which may be pooled on the upper surface of the jaw portion 53, the liquid droplet Y comes out through the slit 9 due to the absence of a flow path for the liquid droplet Y below the jaw portion 53. As a result, the liquid droplet Y flows through the slit 9, adheres to the outer surface of the TE band 7 and causes the ink-jet print or the like made on the outer surface of the TE band 7 to be blurred.

[0027] In the present invention, on the other hand, the flow path forming projection 30 provided on the inner surface of the TE band 7 allows the space X to be formed between the inner surface of the TE band 7 and the outer surface of the jaw portion 53 around the flow path forming projection 30. Further, a gap is formed between the locking projection 19 and the lower surface of the jaw portion 53. Thus, there is a flow path leading to the lower side of the jaw portion 53 between the jaw portion 53 and the inner surface of the skirt wall 5. With this structure, as shown in Fig. 3(b), when air is blown through the slit 9 to the liquid droplet Y of washing water, which may be pooled on the upper surface of the jaw portion 53, the liquid droplet Y flows through the flow path to the lower side of the jaw portion 53 and is discharged without adhering to the outer surface of the TE band 7.

[0028] As described above, the cap 1 of the present invention is capable of successfully removing washing water, thereby effectively preventing, for example, the print from being blurred by washing water remaining in the cap 1.

[0029] In order to maximize the water removal effect of the flow path forming projection 30 in the present invention, it is preferred that a plurality of the locking projections 19 are formed at intervals in the circumferential direction depending on the size of the cap 1, and that the flow path forming projections 30 are formed between and above the respective adjacent locking projections 19, as shown in Fig. 4 showing a partial exploded view of the TE band 7. For example, in a case where the cap has a nominal diameter of 28 mm, it is desirable that approximately three to nine locking projections 19 are formed at total intervals of approximately 1% to 50% of the circumference of the TE band 7. This allows the sufficient space X to be formed around the flow path forming projections 30, thereby effectively removing washing water by air blow. As shown in Fig. 5, the flow path forming projection 30 may axially overlap both ends of the locking projections 19 in the circumferential direction, as long as the flow path forming projection 30 is located above the locking projections 19.

[0030] The flow path forming projection 30 has an axially extending rib shape in the example shown in Fig. 4, or alternatively it can have a block shape as shown in

Fig. 5. In either case, the shape and height of the flow path forming projection 30, the positional relationship between the flow path forming projection and the locking projections 19, and the like may be set to maximize the water removal effect in consideration of die cutting properties during molding of the cap. For example, the height of the flow path forming projection 30 is suitably approximately 0.05 to 0.30 nm. In the example shown in Fig. 4, only the single flow path forming projection 30 is provided between and above the adjacent locking projections 19; however, a plurality of the flow path forming projections 30 may be provided.

[0031] As shown in Patent Document 1, minute ribs are sometimes formed on the inclined surface 21 that is located above the locking projection 19 on the inner surface of the TE band 7. These ribs are provided to allow the TE band 7 separated from the cap 1 to fall immediately without staying on the outer surface of the jaw portion 53. Since these ribs are not intended for the formation of the flow path for removing washing water, they are extremely low in height and are formed at lower positions than the flow path forming projection 30 in the present invention; thus, they achieve almost no water removal function.

[0032] The above-described cap 1 of the present invention can be easily produced from a thermoplastic resin such as an olefin-based resin (e.g., polypropylene, polyethylene, etc.) by injection molding or embossing.

Explanations of Letters or Numerals:

[0033]

1: Cap	
3: Top plate	35
5: Skirt wall	
7: TE band	
9: Slit	
13: Inner ring	
19: Locking projection	40
30: Flow path forming projection	
50: Container mouth portion	
53: Jaw portion	
X: Space	
Y: Liquid droplet of washing water	45

Claims

1. A plastic screw cap including: a top plate; a skirt wall that extends downward from a peripheral edge of the top plate and includes on its inner surface a thread to be screwed to an outer surface of a container mouth portion; and a tamper-evident band that is connected to a lower end of the skirt wall via a breakable bridge and includes on its inner surface a locking projection capable of being locked to a lower surface of a container jaw portion, wherein

the tamper-evident band further includes on its inner surface a flow path forming projection that is located above the locking projection and abuts an outer surface of the container jaw portion to form a flow path between the container jaw portion and an inner surface of the skirt wall.

2. The plastic screw cap according to claim 1, wherein in a region continuing to an upper surface of the locking projection, an annular inclined surface or a circumferentially intermittent arc-shaped inclined surface is formed such that it becomes gradually thicker from top toward an upper end joint of the locking projection, and the flow path forming projection is disposed above the annular inclined surface or the arc-shaped inclined surface.
3. The plastic screw cap according to claim 1, wherein a plurality of the locking projections are formed at regular intervals in a circumferential direction, and the flow path forming projection is disposed between and above each pair of adjacent two locking projections.
4. The plastic screw cap according to claim 1, wherein the flow path forming projection has an axially extending rib shape or a block shape.

Fig. 1

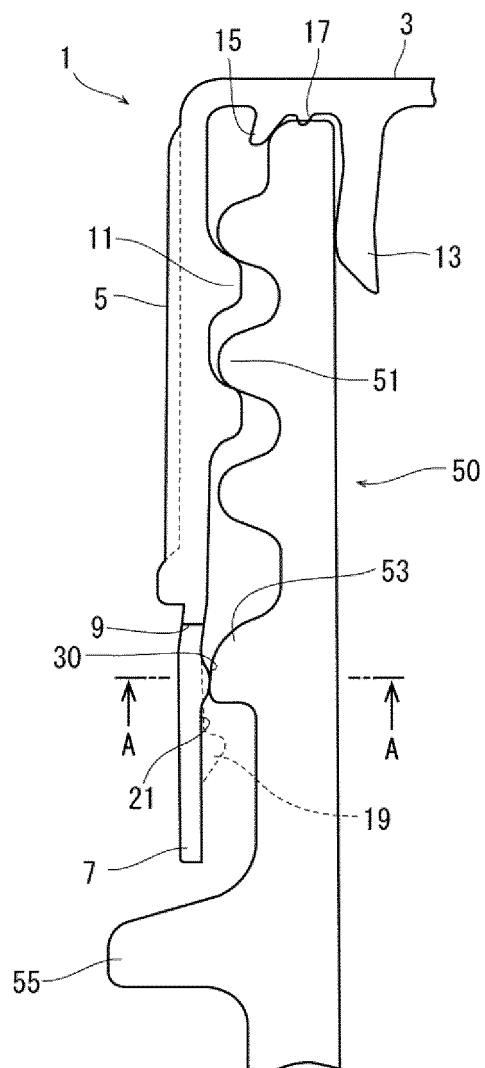


Fig. 2

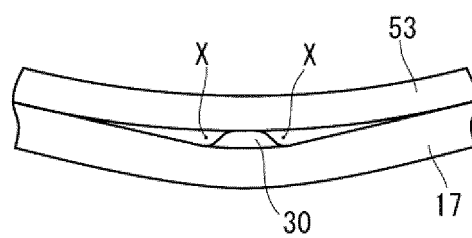


Fig. 3

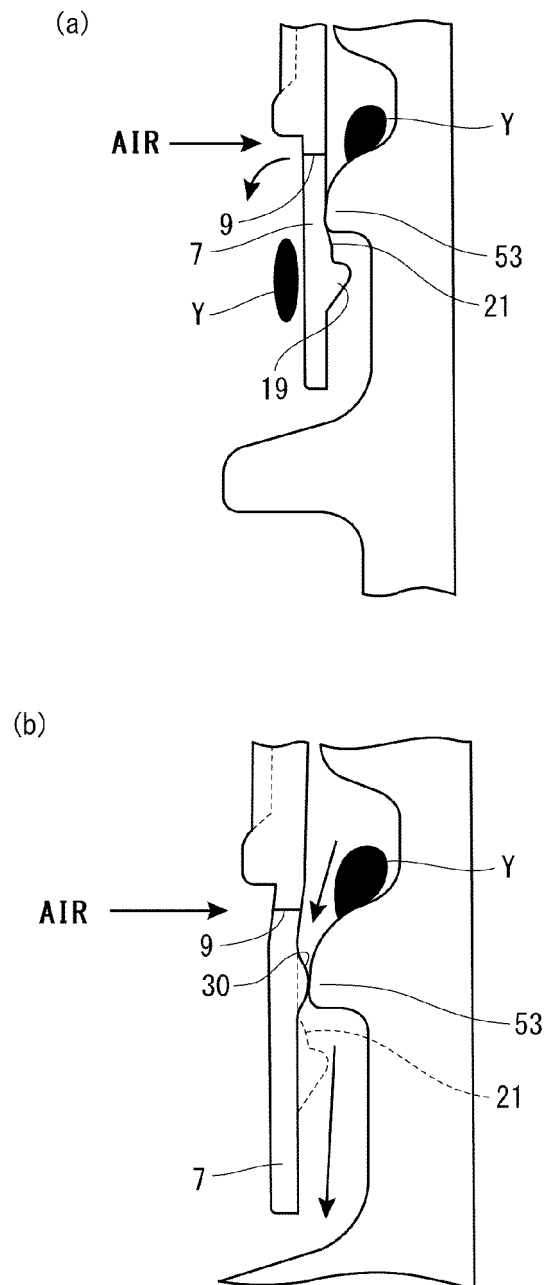


Fig. 4

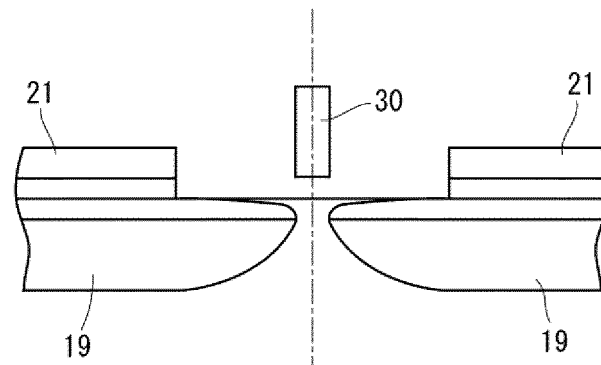
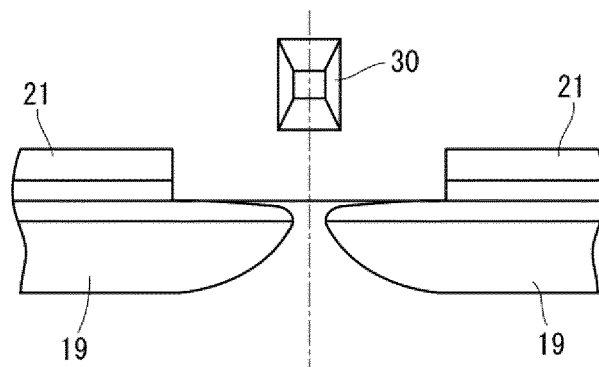


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2022/011522

A. CLASSIFICATION OF SUBJECT MATTER

B65D 41/34(2006.01)j
FI: B65D41/34 116

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D41/34

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2017-218194 A (NIPPON CLOSURES CO., LTD.) 14 December 2017 (2017-12-14) paragraphs [0013], [0018], [0019], [0022], fig. 1-5	1-4
A	JP 2009-179364 A (JAPAN CROWN CORK CO., LTD.) 13 August 2009 (2009-08-13) paragraphs [0016]-[0019], fig. 1-4	1-4
A	JP 2016-16900 A (NIPPON CLOSURES CO., LTD.) 01 February 2016 (2016-02-01) paragraphs [0005]-[0022], fig. 1-3	1-4
A	WO 2013/131773 A1 (TETRA LAVAL HOLDINGS & FINACE S.A.) 12 September 2013 (2013-09-12) p. 8, line 26 to p. 10, line 18, fig. 1-9	1-4

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

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

Date of the actual completion of the international search

10 May 2022

Date of mailing of the international search report

31 May 2022

Name and mailing address of the ISA/JP

Japan Patent Office (ISA/JP)
3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915
Japan

Authorized officer

Telephone No.

PCT/JP2022/011522

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 6393497 B [0007]
- JP 6373099 B [0007]