(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 939 908 A1**

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

(43) Date of publication:
19.01.2022 Bulletin 2022/03

(21) Application number: **20772915.3**

(22) Date of filing: **16.03.2020**

(51) International Patent Classification (IPC):
B65D 71/46 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65D 67/02; B65D 71/46

(86) International application number:
PCT/JP2020/011454

(87) International publication number:
WO 2020/189623 (24.09.2020 Gazette 2020/39)

(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

(30) Priority: **15.03.2019 JP 2019048447**

(71) Applicants:
- **WestRock Packaging Systems, LLC**
  Atlanta GA 30328 (US)
  Designated Contracting States:
  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
- **Shibuya, Katsuo**
  Minato-Ku
  Tokyo 105-0011 (JP)
  Designated Contracting States:
  AL

(72) Inventor: **SHIBUYA Katsuo**
Tokyo 105-0011 (JP)

(74) Representative: **Rule, John Eric**
Coulson & Rule
13 Whitehall Road
Rugby, Warwickshire CV21 3AE (GB)

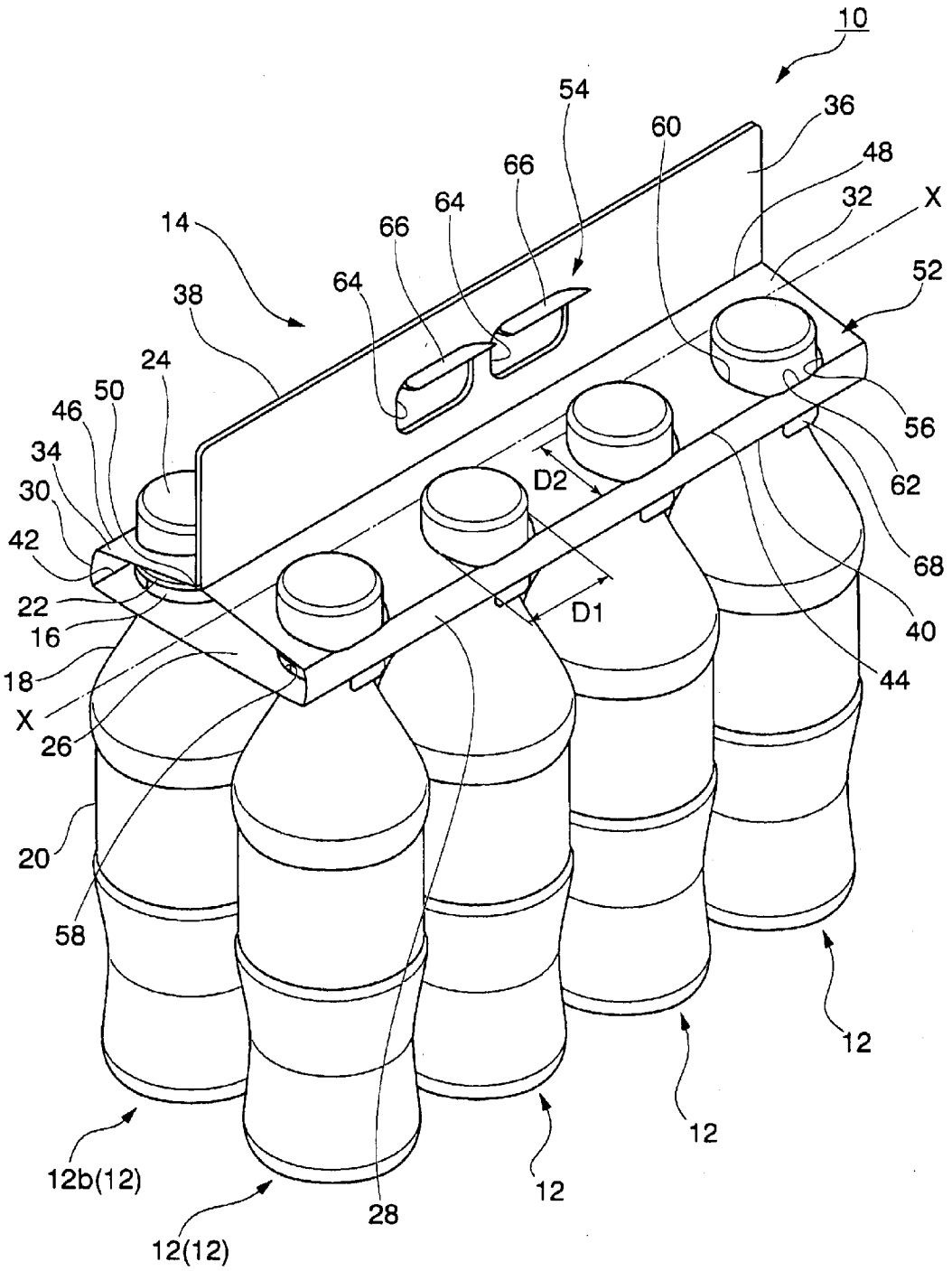
(54) **CARRIER AND BLANK**

(57) A carrier (14) that at least partially holds a container (12) includes a plurality of panels at least partially extending around the interior of the carrier (14). The plurality of panels includes an inclining top panel (32) and a side panel (28). The carrier (14) further includes at least one container receiving mechanism (52) extending at least in the panel (32), and a handle mechanism (54). The mechanism (52) at least partially receives the container (12). The mechanism (54) is so disposed that the mechanism (52) is disposed between the mechanism (54) and the panel (28). The mechanism (52) includes an upper receiving opening (56) defined at least partially in the panel (32). The opening (56) is defined by a boundary containing a first edge (60) and a second edge (62) facing each other. The edge (60) is so disposed as to be closer to the mechanism (54) than the edge (62). The edge (60) has an arch-like shape in which the centre of curvature of the edge (60) is so located as to be closer to the edge (62) than to the edge (60).

EP 3 939 908 A1

(Cont. next page)

Fig. 1


10
54
36
60
48
66
64
32
X
14
66
64
52
38
24
50
46
56
34
62
30
D2
42
68
22
D1
40
16
18
44
X
26
20
58
12
12
12
12b(12)
28
12
12(12)

Description

TECHNICAL FIELD

[0001] The present invention relates to a carrier and a blank, particularly to improvement of a mechanism that supports an article. The present application claims the priority based on Japanese Patent Application No. 2019-048447 filed in Japan on March 15, 2019 and incorporates the content thereof herein by reference.

BACKGROUND ART

[0002] There has been a known carrier used when articles, such as PET bottles each filled with a content, are carried to integrally hold a plurality of the articles.

[0003] An example of the carrier is a carrier attached to an upper portion of an article, for example, as the carriers described in Patent Literatures 1 to 5. Many carriers of this type each include a panel having an opening that accepts the upper portion of an article and a tab that extends toward the interior of the opening from an edge that defines the opening of the panel. A thus configured carrier, in which the upper portion of the article is inserted into the opening of the panel and the tab supports the upper portion of the article inserted into the opening of the panel, can integrally hold a plurality of articles, whereby the plurality of articles can be readily carried.

Citation List

Patent Literature

[0004]

Patent Literature 1 U.S. Patent No. 1,292,897
Patent Literature 2 International Publication No. WO 2005/087609
Patent Literature 3 U.S. Patent No. 6,082,532
Patent Literature 4 European Patent No. 0,889,836
Patent Literature 5 U.S. Patent No. 5,682,982

SUMMARY OF INVENTION

Technical Problem

[0005] The carrier having the advantage described above has still been required to achieve further improvement both in ease of attachment of the carrier to an article and detachment of the article from the carrier and article holdability that allows the carrier to securely hold the article when the article is carried.

[0006] In other words, the upper portion of an article needs to be inserted into the opening of the panel when the carrier is attached to the article and when the article is detached from the carrier. Enlarging the opening of the panel allows the carrier to be readily attached to the article and the article to be readily detached from the carrier.

[0007] Only enlarging the opening of the panel, however, causes in some cases the article to fall off the carrier when the carrier is lifted. There is therefore room for improvement in article holdability.

[0008] On the other hand, to increase the article holdability, it is conceivable to prevent the article from falling off the opening of the panel by reducing the size of the opening of the panel. It is also conceivable to increase the number of tabs that engage with the upper portion of the article inserted into the opening of the panel.

[0009] Only reducing the opening of the panel or increasing the number of tabs causes in some cases the upper portion of the article to be likely to catch the edge that defines the opening of the panel or the tab when the article is attached to or detached from the panel, resulting in cumbersome attachment and detachment in some cases.

[0010] Therefore, in the packaging field, a technology that allows both ease of article attachment and detachment and improvement in article holdability has been strongly desired, but no appropriate technology that can satisfy the desire has been present.

[0011] The present invention has been made in view of the problem with the related art described above, and an object of the present invention is to provide a carrier and a blank that allow both ease of article attachment and detachment and improvement in article holdability.

Solution to Problem

Carrier

[0012] To achieve the object described above, a carrier according to an aspect of the present invention is a carrier that at least partially holds at least one container, the carrier including a plurality of panels at least partially extending around an interior of the carrier. The plurality of panels includes a first inclining top panel and a first side panel connected in a form of a hinge to the first inclining top panel along a lower edge of the first inclining top panel. The carrier further includes at least one container receiving mechanism extending at least in the first inclining top panel and a handle mechanism that allows the carrier to be lifted. The at least one container receiving mechanism at least partially receives the at least one container. The handle mechanism is so disposed that the at least one container receiving mechanism is disposed between the handle mechanism and the first side panel. The at least one container receiving mechanism includes an upper receiving opening defined at least partially in the first inclining top panel. The upper receiving opening is defined by a boundary containing a first edge and a second edge facing each other. The first edge that defines the upper receiving opening is so disposed as to be closer to the handle mechanism than the second edge that defines the upper receiving opening. The first edge that defines the upper receiving opening has an arch-like shape in which a centre of curvature of the first edge is so located as to be closer to the second edge than to the first edge.

[0013] In the carrier according to the aspect of the present invention, the at least one container may include a flange and a top section extending upward beyond the flange, the second edge, which defines the upper receiving opening, may engage with at least part of the flange of the at least one container, and the first edge, which defines the upper receiving opening, may engage with at least part of the top section of the at least one container.

[0014] In the carrier according to the aspect of the present invention, the upper receiving opening may extend to the first side panel in such a way that the first side panel provides the second edge, which defines the upper receiving opening.

[0015] In the carrier according to the aspect of the present invention, the second edge, which defines the upper receiving opening, may be curved.

[0016] The carrier according to the aspect of the present invention may have a centre axial line so specified as to extend in parallel to a lower edge of the first inclining top panel, the upper receiving opening may have a first dimension (D2) extending in a direction perpendicular to the centre axial line, and the first edge and the second edge, which define the upper receiving opening, may face each other in the first dimension (D2) direction of the upper receiving opening.

[0017] In the carrier according to the aspect of the present invention, the upper receiving opening may have a second dimension (D1) extending in a direction parallel to the centre axial line, and the second dimension (D1) of the upper receiving opening may be greater than the first dimension (D2) of the upper receiving opening.

[0018] In the carrier according to the aspect of the present invention, the top section of the at least one container may have a roughly cylindrical shape that specifies a diameter of the top section, and the second dimension (D1) of the upper receiving opening may be greater than the diameter of the top section of the container.

[0019] In the carrier according to the aspect of the present invention, the flange of the at least one container may have a roughly ring-like shape that defines a diameter of the flange, and the second dimension (D1) of the upper receiving opening may be greater than the diameter of the flange of the container.

[0020] In the carrier according to the aspect of the present invention, the first dimension (D2) of the upper receiving opening may be smaller than or equal to the diameter of the flange of the container.

[0021] In the carrier according to the aspect of the present invention, the first dimension (D2) of the upper receiving opening may be greater than or equal to 29 mm but smaller than or equal to 33 mm. In other words, the reason why the first dimension (D2) is set as described above is that when the first dimension (D2) of the upper receiving opening is smaller than 29 mm, the attachment and detachment of the article is affected in some cases, whereas when the first dimension (D2) of the upper receiving opening is greater than 33 mm, the article holdability is affected in some cases. To more reliably achieve ease of article attachment and detachment and improvement in article holdability, the first dimension (D2) of the upper receiving opening may be greater than or equal to 29 mm but smaller than or equal to 33 mm.

[0022] In the carrier according to the aspect of the present invention, the plurality of panels may further include a base panel connected in a form of a hinge to a lower edge of the first side panel, the at least one container receiving mechanism may include a lower receiving opening that is defined at least partially in the base panel, and when the at least one container is at least partially received by the at least one container receiving mechanism, a centre (*I*) of the lower receiving opening may not be aligned in a vertical direction with a centre of curvature (II) of the first edge, which defines the upper receiving opening, and the centre (*I*) of the lower receiving opening may be offset in a direction away from the first side panel from the centre of curvature (II) of the first edge, which defines the upper receiving opening.

[0023] In the carrier according to the aspect of the present invention, the plurality of panels may further include a base panel, a second side panel, and a second inclining top panel. The base panel may be connected in a form of a hinge to a lower edge of the first side panel. The second side panel may be so connected in a form of a hinge to the base panel via a lower edge of the second side panel as to face the first side panel. The second inclining top panel may be connected

in a form of a hinge to an upper edge of second side panel and extend toward an upper edge of the first inclining top panel.

[0024] In the carrier according to the aspect of the present invention, the handle mechanism may include at least one handle panel. The at least one handle panel may be connected in a form of a hinge to the upper edge of the first inclining top panel.

Blank

[0025] A blank according to an aspect of the present invention for achieving the object described above includes a blank for forming the carrier according to the aspect of the present invention.

[0026] The blank according to the aspect of the present invention is a blank for forming the carrier according to the aspect of the present invention, that is, a blank for forming a carrier that at least partially holds at least one container. The blank includes a plurality of panels. The plurality of panels include a first inclining top panel and a first side panel connected in a form of a hinge to the first inclining top panel along a connection line of the first inclining top panel. The blank further includes at least one container receiving mechanism extending at least in the first inclining top panel and a handle mechanism. The at least one container receiving mechanism at least partially receives the at least one container. The handle mechanism is so disposed that the at least one container receiving mechanism is disposed between the handle mechanism and the first side panel. The at least one container receiving mechanism includes an upper receiving opening defined by a breaking line at least partially in the first inclining top panel. The upper receiving opening is defined by a boundary containing a first edge and a second edge facing each other. The first edge that defines the upper receiving opening is so disposed as to be closer to the handle mechanism than the second edge that defines the upper receiving opening. The first edge that defines the upper receiving opening has an arch-like shape in which a centre of curvature of the first edge is so located as to be closer to the second edge than to the first edge.

[0027] In the blank according to the aspect of the present invention, the second edge, which defines the upper receiving opening, may engage with at least part of a flange of the at least one container, and the first edge, which defines the upper receiving opening, may engage with at least part of a top section of the at least one container.

[0028] In the blank according to the aspect of the present invention, the upper receiving opening may extend to the first side panel in such a way that the first side panel provides the second edge, which defines the upper receiving opening.

[0029] In the blank according to the aspect of the present invention, the second edge, which defines the upper receiving opening, may be curved.

[0030] The blank according to the aspect of the present invention may have a centre axial line so specified as to extend in parallel to the connection line of the first inclining top panel, the upper receiving opening may have a first dimension (D2) extending in a direction perpendicular to the centre axial line, and the first edge and the second edge, which define the upper receiving opening, may face each other in a first dimension (D2) direction of the upper receiving opening.

[0031] In the blank according to the aspect of the present invention, the upper receiving opening may have a second dimension (D1) extending in a direction parallel to the centre axial line, and the second dimension (D1) of the upper receiving opening may be greater than the first dimension (D2) of the upper receiving opening.

[0032] In the blank according to the aspect of the present invention, when the top section of the container to be held by a carrier formed of an assembled blank has a roughly cylindrical shape that specifies a diameter of the top section, the second dimension (D1) of the upper receiving opening may be greater than the diameter of the top section of the container.

[0033] In the blank according to the aspect of the present invention, when the flange of the container to be held by a carrier formed of an assembled blank has a roughly ring-like shape that specifies a diameter of the flange, the second dimension (D1) of the upper receiving opening may be greater than the diameter of the flange of the container.

[0034] In the blank according to the aspect of the present invention, the first dimension (D2) of the upper receiving opening may be smaller than or equal to the diameter of the flange of the container.

[0035] In the blank according to the aspect of the present invention, the first dimension (D2) of the upper receiving opening may be greater than or equal to 29 mm but smaller than or equal to 33 mm.

[0036] In the blank according to the aspect of the present invention, the plurality of panels may further include a base panel connected in a form of a hinge to a connection line of the first side panel, the at least one container receiving mechanism may include a lower receiving opening that is defined by a breaking line at least partially in the base panel, and when the at least one container is at least partially received by the at least one container receiving mechanism, a centre (*I*) of the lower receiving opening may not be aligned in a vertical direction with a centre of curvature (*II*) of the first edge, which defines the upper receiving opening, and the centre (*I*) of the lower receiving opening may be offset in a direction away from the first side panel from the centre of curvature (*II*) of the first edge, which defines the upper receiving opening.

[0037] In the blank according to the aspect of the present invention, the plurality of panels may further include a base panel, a second side panel, and a second inclining top panel. The base panel may be connected in a form of a hinge to a lower edge of the first side panel. The second side panel may be so connected in a form of a hinge to the base panel

via a connection line of the second side panel as to face the first side panel. The second inclining top panel may be connected in a form of a hinge to the connection line of the second side panel and extend toward an upper edge of the first inclining top panel.

[0038] In the blank according to the aspect of the present invention, the handle mechanism may include at least one handle panel. The at least one handle panel may be connected in a form of a hinge to the connection line of the first inclining top panel.

Advantageous Effects of Invention

[0039] The carrier according to the aspect described above, which is a single carrier including the plurality of panels formed of at least the inclining top panels and the side panels combined with the container receiving mechanism, allows both ease of article attachment and detachment and improvement in article holdability.

[0040] The blank according to the aspect described above, which includes the plurality of panels formed of at least the inclining top panels and the side panels combined with the container receiving mechanism, allows more reliable formation of a carrier that excels in ease of article attachment and detachment and article holdability.

BRIEF DESCRIPTION OF DRAWINGS

[0041]

Figure 1 is an external appearance perspective view showing a package using a carrier according to an embodiment of the present invention.
Figure 2 shows a tubular structure of the carrier shown in Figure 1 viewed along a centre axial line (line X-X).
Figure 3 is a descriptive diagram showing the lifted carrier shown in Figure 2.
Figure 4 describes the relationship between the carrier and a cap with the carrier shown in Figure 3 lowered.
Figure 5 describes the relationship between the carrier and the cap with the carrier shown in Figure 3 lifted.
Figure 6 is a descriptive diagram showing a developed blank for forming the carrier shown in Figure 1.
Figure 7 is an enlarged view of an upper receiving opening of the blank shown in Figure 6.

DESCRIPTION OF EMBODIMENT

[0042] An embodiment of the present invention will be described below based on the drawings. Figure 1 shows a package using a carrier according to the embodiment of the present invention. Figure 2 shows a tubular structure of the carrier shown in Figure 1 viewed along a centre axial line (line X-X).

[0043] A package 10 according to the present embodiment includes containers 12, such as eight PET bottles each filled with a content, and a single carrier 14.

[0044] The containers 12 each includes a neck section 16, a shoulder section 18 connected to the neck section 16, a barrel section 20 connected to the shoulder section 18, an outward flange (flange) 22 provided around the outer circumference of the neck section 16, and a cap (top section of container) 24 attached to the neck section 16. In the present embodiment, the eight containers 12 are arranged in a 2×4 array.

[0045] The carrier according to the embodiment of the present invention at least partially holds the containers. In the present embodiment, the single carrier 14 having the tubular structure (a structure at least partially extending around interior of the carrier) is attached to an upper portion of each of the containers 12 arranged in the 2×4 array. The carrier 14 having the tubular structure covers the neck section 16 and the cap 24 of each of the container 12 with the outward flange 22 of each of the containers 12 sandwiched by the carrier 14.

[0046] The carrier according to the embodiment of the present invention includes a plurality of panels at least partially extending around the interior of the carrier. The carrier 14 according to the present embodiment includes as the plurality of panels according to the embodiment of the invention a base panel 26, a first side panel 28, a second side panel 30, a first inclining top panel 32, a second inclining top panel 34, a first handle panel 36, and a second handle panel 38, which are each made of paperboard.

[0047] The base panel 26 is connected in the form of a hinge to the first side panel 28 via a connection line 40. The first side panel 28 is connected in the form of a hinge to the first inclining top panel 32 via a connection line (a lower edge of the first inclining top panel 32) 44. The first inclining top panel 32 is connected in the form of a hinge to the first handle panel 36 via a connection line 48.

[0048] The base panel 26 is further connected in the form of a hinge to the second side panel 30 via a connection line 42. The second side panel 30 is connected in the form of a hinge to the second inclining top panel 34 via a connection line (a lower edge of the second inclining top panel 34) 46. The second inclining top panel 34 is connected in the form of a hinge to the second handle panel 38 via a connection line 50.

[0049] The plurality of panels of the carrier according to the embodiment of the present invention at least partially extend around the interior of the carrier. Therefore, in the present embodiment, the base panel 26, the first side panel 28, the second side panel 30, the first inclining top panel 32, the second inclining top panel 34, the first handle panel 36, and the second handle panel 38 define the tubular structure shown in Figure 2.

[0050] In the present embodiment, the carrier 14 includes a container receiving mechanism 52 and a handle mechanism 54. The handle mechanism 54 is so disposed that the container receiving mechanism 52 is disposed between the handle mechanism 54 and the first side panel 28. The handle mechanism 54 is further so disposed that the container receiving mechanism 52 is disposed between the handle mechanism 54 and the second side panel 30.

[0051] The container receiving mechanism 52 extends at least along the first inclining top panel 32 and the second inclining top panel 34. The container receiving mechanism 52 according to the embodiment of the present invention at least partially receives the containers 12. In the present embodiment, the container receiving mechanism 52 receives the neck section 16, the flange 22, and the cap 24 as the upper portion of each of the containers 12. The container receiving mechanism 52 includes upper receiving openings 56 and lower receiving openings 58, which are at least partially defined at the first inclining top panel 32 and the second inclining top panel 34. The upper receiving openings 56 are each defined by a boundary including a first edge 60 and a second edge 62 facing each other. The first edge 60 is so disposed as to be closer to the handle panel (handle mechanism) than the second edge 62. The first edge 60 has an arch-like shape in which the centre of curvature of the first edge 60 is closer to the second edge 62 than to the first edge 60. In the present embodiment, the upper receiving openings 56 extend from the first inclining top panel 32 beyond the connection line 44 to the first side panel 28. Similarly, the upper receiving openings 56 extend from the second inclining top panel 34 beyond the connection line 46 to the second side panel 30.

[0052] The handle mechanism 54 is intended to lift the carrier 14. To this end, the handle mechanism 54 includes the first handle panel 36 and the second handle panel 38. The handle mechanism 54 includes handle openings 64 and handle tabs 66, which are formed in the first handle panel 36 and the second handle panel 38, respectively. A user can therefore readily lift the carrier 14 by inserting fingers into the handle openings 64 of the first handle panel 36 and the second handle panel 38. The user can also readily lift the carrier 14 by grasping the first handle panel 36 and the second handle panel 38.

[0053] In the present embodiment, the carrier 14 includes operation tabs 68. In the present embodiment, the operation tabs 68 have, for example, two functions shown below. The operation tabs 68 are so configured that when the carrier 14 is lifted, the containers 12 each press the second edge 62, which defines the upper receiving opening 56, outward in such a way that the second edge 62 is firmly pressed against the outward flange 22 of the container 12. When the carrier 14 is lowered, the user can grasp any of the operation tabs 68 to disengage the container 12 from the second edge 62, which defines the upper receiving opening 56.

[0054] The carrier 14 according to the present embodiment is roughly configured as described above, and the effects of the carrier 14 will be described below.

[0055] The user can lift the carrier 14 with fingers put in the handle openings 64 of the carrier 14, as shown in Figure 3.

[0056] The tubular structure of the carrier 14 is then deformed from the shape of the tubular structure shown in Figure 2 into the shape of the tubular structure shown in Figure 3. The containers 12 lowers due to their own weight in a direction indicated by arrows A in Figure 3. The bottom of a container 12a and the bottom of a container 12b, which are adjacent to each other with the centre axial line (line X-X) sandwiched therebetween, incline in a direction indicated by arrows B and come into contact with each other in Figure 3. The top section of the container 12a and the top section of the container 12b, which are adjacent to each other with the centre axial line (line X-X) sandwiched therebetween, incline in a direction indicated by arrows C in Figure 3 with the portion where the bottom of the container 12a and the bottom of the container 12b, which are adjacent to each other with the centre axial line (line X-X) sandwiched therebetween, are in contact with each other serving as a pivotal point.

[0057] A lower end surface of the outward flange 22 of each of the containers 12 is firmly pressed in a direction indicated by an arrow D against the second edge 62, which defines the upper receiving opening 56. When the shape of the tubular structure is deformed from the shape of the tubular structure shown in Figure 2 into the shape of the tubular structure shown in Figure 3, a upward/downward-direction position of the second edge 62, which defines the upper receiving opening 56, with respect to the lower end surface of the outward flange 22 of the container 12 remains unchanged.

[0058] On the other hand, in the shape of the tubular structure shown in Figure 3, the upward/downward-direction position of the first edge 60, which defines the upper receiving opening 56, with respect to the outer circumferential surface of the cap 24 is shifted upward as compared with the position in the shape of the tubular structure shown in Figure 2.

[0059] Specifically, in the shape of the tubular structure shown in Figure 2, the upward/downwarddirection position of the first edge 60, which defines the upper receiving opening 56, with respect to the outer circumferential surface of the cap 24 is low. In the shape of the tubular structure shown in Figure 2, force large enough to affect the attachment and detachment of each of the containers 12 does not act on the portion between the outer circumferential surface of the cap 24 and the first edge 60, which defines the upper receiving opening 56, even when the first edge 60, which defines

the upper receiving opening 56, is in contact with the outer circumferential surface of the cap 24. The container 12 can therefore be readily attached and detached. Further, in the present embodiment, in which no support tab extending from the edge that defines an opening toward the interior of the opening is used, unlike in the case of the carrier of the related art, the container 12 can therefore be more readily attached and detached.

[0060] On the other hand, when the carrier 14 is lifted upward, the upward/downward-direction position of the first edge 60, which defines the upper receiving opening 56, with respect to the outer circumferential surface of the cap 24 moves upward, while the first edge 60, which defines the upper receiving opening 56, is in contact with the outer circumferential surface of the cap 24, as shown in Figure 3. As the upward/downward-direction position of the first edge 60, which defines the upper receiving opening 56, with respect to the outer circumferential surface of the cap 24 rises, engagement force acting on the portion between the outer circumferential surface of the cap 24 and the first edge 60, which defines the upper receiving opening 56, gradually increases. As a result, the first edge 60, which defines the upper receiving opening 56, is more strongly pressed against the outer circumferential surface of the cap 24 in a direction indicated by arrow E in Figure 3. The container 12 is therefore more securely held between the first edge 60 and the second edge 62, which define the upper receiving opening 56. In the present embodiment, which employs a method for holding the upper portion of each of the containers between the first edge 60 and the second edge 62, which define the upper receiving opening 56, in the shape of the tubular structure shown in Figure 3, instead of the related-art method, that is, the related-art method for holding the upper portion of each of the containers by using the support tab extending from the edge that defines the opening toward the interior of the opening, the containers 12 can be more reliably held.

[0061] Further, according to the present embodiment, the tubular structure of the carrier 14 is deformed from the shape of the tubular structure shown in Figure 3 into the shape of the tubular structure shown in Figure 2 when the carrier 14 is lowered, further, when the handle panels are pressed down. As a result, the strong engagement between the first edge 60, which defines the upper receiving opening 56, and the outer circumferential surface of the cap 24 is released, and the strong engagement between the second edge 62, which defines the upper receiving opening 56, and the outward flange 22 of the container 12 is released. At this point, no force large enough to affect the attachment and detachment of the container 12 acts on the portion between the upper receiving opening 56 of the carrier 14 and the container 12. Therefore, the container 12 can be readily detached from the carrier 14, and the container 12 can be readily attached to the carrier 14.

[0062] The aforementioned relationship between the containers 12 and the carrier 14 will be more specifically described below with reference to Figures 4 and 5.

[0063] Figure 4 shows an example of the relationship between one of the containers 12 and the carrier 14 with the carrier 14 lowered. In Figure 4, the second edge 62, which defines the upper receiving opening 56, is in light contact with the lower end surface of the outward flange 22 of each of the containers 12. In Figure 4, the first edge 60, which defines the upper receiving opening 56, is in light contact with the outer circumferential surface of the cap 24. In Figure 4, the upward/downward-direction position of the first edge 60, which defines the upper receiving opening 56 of the first inclining top panel 32, with respect to the outer circumferential surface of the cap 24 is lower than the upward/downward-direction position shown in Figure 5.

[0064] Figure 5 shows an example of the relationship between one of the containers 12 and the carrier 14 with the carrier 14 shown in Figure 4 lifted. Lifting the carrier 14 increases the inclination of the first inclining top panel 32 with respect to the first side panel 28 in the vertical direction as compared with the inclination shown in Figure 4. Lifting the carrier 14 causes the upper portion of the container 12 to incline in a direction indicated by an arrow C in Figure 5. At this point, the centre (*I*) of the lower receiving opening 58 of the carrier 14 is not aligned with the centre of curvature (*II*) of the first edge 60, which defines the upper receiving opening 56, in the vertical direction (upward/downward direction in Figure 5), and the centre (*I*) of the lower receiving opening 58 is shifted (offset) from the centre of curvature (*II*) of the first edge 60, which defines the upper receiving opening 60, in a direction away from the first side panel 28 (leftward in Figure 5), as shown in Figure 5. Lifting the carrier 14 as described above allows the lower end surface of the outward flange 22 of the container 12 to be strongly pressed against the second edge 62, which defines the upper receiving opening 56, along a direction indicted by an arrow D in Figure 5. As a result, the second edge 62, which defines the upper receiving opening 56 of the carrier 14, can securely hold the lower end surface of the outward flange 22 of the container 12.

[0065] Even when the inclination of the first inclining top panel 32 with respect to the first side panel 28 increases toward the vertical direction, the upward/downward position (upward/downward contact position) of the second edge 62, which defines the upper receiving opening 56, with respect to the lower end surface of the outward flange 22 of the container 12, does not change. On the other hand, as the inclination of the first inclining top panel 32 with respect to the first side panel 28 increases toward the vertical direction, the upward/downward position of the first edge 60, which defines the upper receiving opening 56 of the first inclining top panel 32, with respect to the outer circumferential surface of the cap 24 gradually moves upwards. As a result, the first edge 60, which defines the upper receiving opening 56, can be more strongly pressed against the outer circumferential surface of the cap 24 in a direction indicated by an arrow E in Figure 5. Lifting the carrier 14 as described above allows the first edge 60, which defines the upper receiving opening

56 of the carrier 14, to be securely held along the outer circumferential surface of the cap 24.

[0066] According to the present embodiment, lifting the carrier 14 allows the first edge 60 and the second edge 62, which define the upper receiving opening 56 of each of the containers 12, to more strongly sandwich the outer circumferential surface of the cap 24 and the lower end surface of the outward flange 22 of the container 12, whereby the article holdability of the carrier 14 can be improved. The carrier 14 according to the present embodiment allows significant improvement in the article holdability as compared, for example, with the related-art carrier, which supports each container with the support tab extending from the edge that defines the opening of the panel toward the interior of the opening.

[0067] As described above, the single carrier 14 according to the present embodiment allows the containers 12 to be more readily attached and detached and the article holdability to be improved.

[0068] The effects provided by the carrier 14 according to the present embodiment will be more specifically described below. In the present embodiment, for example, inserting the handle tabs 66 of the second handle panel 38 into the handle openings 64 of the first handle panel 36 and overlaying the first handle panel 36 and the second handle panel 38 on each other allows the base panel 26, the first side panel 28, the second side panel 30, the first inclining top panel 32, and the second inclining top panel 34 to define the characteristic tubular structure of the carrier 14 according to the present embodiment.

[0069] In the present embodiment, the containers 12 each include the outward flange 22 and the cap (top section) 24, which extends upward beyond the outward flange 22. Lifting the carrier 14 therefore allows securer engagement between the second edge 62, which defines the upper receiving opening 56, and at least part of the outward flange 22 of each of the containers 12 (at least part of the lower end surface of the outward flange). Lifting the carrier 14 also allows securer engagement between the first edge 60, which defines the upper receiving opening 56, and at least part of the outer circumferential surface (top section) of the cap 24 of each of the containers 12. The carrier 14 according to the present embodiment can therefore securely hold the containers 12 each including the outward flange 22 and the cap 24.

[0070] In the present embodiment, the upper receiving openings 56 each extend to the first side panel 28 in such a way that the first side panel 28 provides the second edge 62, which defines the upper receiving opening 56. Similarly, the upper receiving openings 56 each extend to the second side panel 30 in such a way that the second side panel 30 provides the second edge 62, which defines the upper receiving opening 56. Therefore, lifting the carrier 14 allows the second edge 62, which defines the upper receiving opening 56, to more securely hold the lower end surface of the outward flange 22 of the container 12. The effect described above will more specifically be described below. Lifting the carrier changes the angle of inclination of the inclining top panels with respect to the side panels. If the second edge 62, which defines the upper receiving opening 56, is located on the connection line that connects the side panel to the inclining top panel in the form of hinges, the inclining motion of the inclining top panel with respect to the side panel conceivably causes the lower end surface of the outward flange 22 of the container 12 to disengage from the second edge 62, which defines the upper receiving opening 56. On the other hand, in the carrier 14 according to the present embodiment, the upper receiving openings 56 each extend to the first side panel 28 in such a way that the first side panel 28 that is not located on the connection line 44 but is located in a portion away from the connection line 44 provides the second edge 62, which defines the upper receiving opening 56. Further, the upper receiving openings 56 each extend to the second side panel 30 in such a way that the second side panel 30 that is not located on the connection line 46 but is located in a portion away from the connection line 46 provides the second edge 62, which defines the upper receiving opening 56. In other words, the position of the pivotal point of the inclining motion of each inclining top panel with respect to the side panel is shifted from the position where the second edge 62, which defines the upper receiving opening 56, supports the outward flange 22. Therefore, when the carrier is lifted, the inclining top panel inclines with respect to the side panel, but the second edge 62, which defines the upper receiving opening 56, can more reliably support the lower end surface of the outward flange 22 of the container 12.

[0071] In the present embodiment, each second edge 62, which defines the upper receiving opening 56, is curved. The second edge 62, which defines the upper receiving opening 56, can therefore more satisfactorily support the container 12. For example, the second edge 62, which defines the upper receiving opening 56, can adequately support even a container 12 having dimensions different to some extent from those of an intended container 12.

[0072] In the present embodiment, the carrier 14 has the centre axial line (line X-X) so specified as to extend in parallel to the connection line (lower edge) 44 of the first inclining top panel 32 and the connection line (lower edge) 46 of the second inclining top panel 34. The upper receiving openings 56 each have a first dimension (D2) extending in the direction perpendicular to the centre axial line (line X-X), and the first edge 60 and the second edge 62, which define the upper receiving opening 56, face each other in the first dimension (D2) direction. As described above, since first edge 60 and the second edge 62, which define the upper receiving opening 56, face each other in the first dimension (D2) direction, lifting the carrier 14 allows the container to be securely sandwiched between the first edge 60 and the second edge 62, which define the upper receiving opening 56. On the other hand, lowering the carrier 14 causes the force having magnitude that affects the attachment and detachment of the container 12 not to act on the portion between the upper receiving opening 56 and the container 12. As a result, the container 12 can be readily attached and detached.

[0073] In the present embodiment, the upper receiving openings 56 each have a second dimension (D1) extending

in the direction parallel to the centre axial line (line X-X), and the second dimension (D1) of the upper receiving opening 56 is greater than the first dimension (D2) of the upper receiving opening 56. The attachment and detachment of the containers, in particular, can therefore be more readily performed. Further, a larger number of containers 12 having different dimensions can be handled.

[0074] In the present embodiment, the cap 24 of each of the containers 12 has a roughly cylindrical shape that specifies the diameter of the cap 24, and the second dimension (D1) of the upper receiving opening 56 is greater than the diameter of the cap 24. Therefore, when each container 12 is attached or detached, a situation in which the cap 24 catches the upper receiving opening 56 can be more reliably avoided, whereby the container 12 can be more readily attached and detached.

[0075] In the present embodiment, the outward flange 22 of each of the containers 12 has a roughly ring-like shape that defines the diameter of the outward flange 22, and the second dimension (D1) of the upper receiving opening 56 is greater than the diameter of the outward flange 22. Therefore, when each container 12 is attached or detached, a situation in which the outward flange 22 of the container 12 catches the upper receiving opening 56 in the second dimension (D1) direction can be more reliably avoided, whereby the container 12 can be more readily attached and detached.

[0076] In the present embodiment, the first dimension (D2) of each of the upper receiving openings 56 is smaller than or equal to the diameter of the outward flange 22. The lower end surface of the outward flange 22 of each of the containers 12 is therefore more reliably allowed to come into contact with the second edge 62 of the upper receiving opening 56 in the first dimension (D2) direction, whereby the containers 12 can be more reliably held.

[0077] In the present embodiment, the first dimension (D2) of each of the upper receiving openings 56 is greater than or equal to 29 mm but smaller than or equal to 33 mm. Improvement in holdability of a standard-size PET bottle and ease of attachment and detachment thereof can be more reliably both achieved.

[0078] In the present embodiment, the container receiving mechanism 52 includes the lower receiving openings 58, which are defined at least partially in the base panel 26. Therefore, when the containers 12 are at least partially received by the container receiving mechanism 52, the centre (*I*) of each of the lower receiving openings 58, which are defined in the base panel 26, is not aligned in the vertical direction with the centre of curvature (*II*) of the first edge 60, which defines the upper receiving opening 56, and the centre (*I*) of the lower receiving opening 58 is offset in the direction away from the first side panel from the centre of curvature (*II*) of the first edge 60, which defines the upper receiving opening 56. Therefore, when a container 12 is received by the container receiving mechanism 52 of the carrier 14, the lower receiving opening 58 allows the upper receiving opening 56 to fully provide the article holdability.

[0079] In the present embodiment, the base panel, the second side panel, and the second inclining top panel are further provided as the plurality of panels according to the embodiment of the present invention. The base panel, the first side panel, the second side panel, the first inclining top panel, and the second inclining top panel can therefore define the characteristic tubular structure of the carrier 14 according to the present embodiment. As a result, when the carrier 14 is lifted and lowered, the tubular structure of the carrier 14 can be adequately deformed. Therefore, when the carrier 14 is lifted, the carrier 14 can securely hold the containers 12. On the other hand, when the carrier 14 is lowered, the attachment and detachment of the containers 12 to and from the carrier 14 can be more readily performed.

[0080] In the present embodiment, the handle mechanism 54 includes the first handle panel 36, which is connected in the form of a hinge to the upper edge of the first inclining top panel 32. The handle mechanism 54 further includes the second handle panel 38, which is connected in the form of a hinge to the upper edge of the second inclining top panel 46. As a result, the first handle panel 36 and the second handle panel 38 allow the carrier 14 to be more readily lifted and lowered.

[0081] The single carrier 14 according to the present embodiment allows both ease of article attachment and detachment and excellent article holdability.

Blank

[0082] Figure 6 shows a developed blank for forming the carrier 14 according to the present embodiment. Figure 7 is an enlarged view of an upper receiving opening of the blank shown in Figure 6. A portion corresponding to the portion in Figure 1 described above has a reference number greater by 100 than the corresponding reference number and will not be described.

[0083] In the present embodiment, a blank 170 includes a base panel 126, a first side panel 128, a second side panel 130, a first inclining top panel 132, a second inclining top panel 134, a first handle panel 136, and a second handle panel 138.

[0084] The base panel 126 is connected in the form of a hinge to the first side panel 128 via a folding line (connection line) 140. The first side panel 128 is connected in the form of a hinge to the first inclining top panel 132 via a folding line (connection line) 144. The first inclining top panel 132 is connected in the form of a hinge to the first handle panel 136 via a folding line (connection line) 148. The base panel 126 is further connected in the form of a hinge to the second

side panel 139 via a folding line (connection line) 142. The second side panel 130 is connected in the form of a hinge to the second inclining top panel 134 via a folding line (connection line) 146. The second inclining top panel 134 is connected in the form of a hinge to the second handle panel 138 via a folding line (connection line) 150.

[0085] In the blank 170, upper receiving openings 152 are each defined by a breaking line 172 in the first inclining top panel 132 and the first side panel 128. The upper receiving openings 152 are each defined by the breaking line 172 also in the second inclining top panel 134 and the second side panel 130.

[0086] Lower receiving openings 152 are each defined by a breaking line 174 in the base panel 126.

[0087] The upper receiving openings 156 are each defined by a boundary containing a first edge 160 and a second edge 162 facing each other in the direction perpendicular to the centre axial line (line X-X). The first edge 160, which defines the upper receiving opening 156, is so disposed as to be closer to the handle mechanism 154 than the second edge 162, which defines the upper receiving opening 156. The first edge 160, which defines the upper receiving opening 156, has an arch-like shape in which the centre of curvature of the first edge 162, which defines the upper receiving opening 156, is closer to the second edge 162, which defines the upper receiving opening 156, than to the first edge 162, which defines the upper receiving opening 156. The second edge 162, which defines the upper receiving opening 156, is curved.

[0088] The upper receiving openings 156 each have the first dimension (D2) extending in the direction perpendicular to the centre axial line (line X-X). The first edge 160 and the second edge 162, which define the upper receiving opening 156, face each other in the first dimension (D2) direction. The upper receiving openings 156 each have the second dimension (D1) extending in the direction parallel to the centre axial line (line X-X). The second dimension (D1) of the upper receiving opening 156 is greater than the first dimension (D2) of the upper receiving opening 156.

[0089] In a case where the diameter of a cap of an upper portion of a standard PET bottle is about 30 mm, and the diameter of a neck flange of a neck section of the standard PET bottle (container) is about 33 mm, the first dimension (D2) is about 30 mm, and the second dimension (D1) is about 34 mm by way of example.

[0090] In Figure 6, the dimension (W1) is roughly equal to the maximum diameter of each of the containers 12 plus the diameter of the lower receiving opening 158. In Figure 6, the dimension (W2) is typically about 13 mm. In Figure 6, the dimension (W3) is about half the dimension (W1) + α (α = 1 to 2 mm, for example).

[0091] In a case where the diameter of the cap of the upper portion of the standard PET bottle is about 30 mm, and the diameter of the neck flange of the neck section of the standard PET bottle (container) is about 33 mm, the dimension (W1) is about 104 mm, the dimension (W2) is about 13 mm, and the dimension (W3) is about 53 mm by way of example.

[0092] Handle tabs 166 are each defined by a breaking line 176 in the first handle panel 136 and the second handle panel 138.

[0093] The blank 170 according to the present embodiment allows more reliable formation of the carrier 14 according to the present embodiment that excels in ease of the article attachment and detachment and the article holdability.

Variations

[0094] The aspects of the present invention are not limited to the embodiment described above and can be changed in a variety of manners as long as the changes fall within the scope of the present invention.

Article

[0095] For example, the above embodiment has been described with reference to the case where a container filled with a content is used as the article (container), but the aspects of the present invention are not limited to the embodiment described above, and another article can be used as long as the other article falls within the scope of the present invention.

Dimensions

[0096] In the embodiment described above, the dimensions of key portions of the carrier have been described based on the dimensions of a typical PET bottle, but the aspects of the present invention are not limited to the embodiment described above, and the dimensions of the carrier can be changed in accordance with the dimensions of the article (container) as long as the changes fall within the scope of the present invention.

Industrial Applicability

[0097] The present invention is applicable to a carrier and a blank that allow both ease of article attachment and detachment and improvement in article holdability.

Reference Signs List

[0098]

10	Package
12	Container (article)
14	Carrier
16	Neck section
22	Outward flange (flange)
24	Cap (top section of article)
26, 126	Base panel
28, 128	First side panel
30, 130	Second side panel
32, 132	First inclining top panel
34, 134	Second inclining top panel
36, 136	First handle panel
38, 138	Second handle panel
40, 42, 44, 46, 48, 50, 140, 142, 144, 146, 148, 150	Connection line (folding line)
52, 152	Container receiving mechanism
54, 154	Handle mechanism
56, 156	Upper receiving opening
58, 158	Lower receiving opening
60, 160	First edge
62, 162	Second edge
64, 164	Handle opening
66, 166	Handle tab
68, 168	Operation tab
170	Blank
172, 174, 176	Breaking line
Line X-X	Centre axial line

Claims

1. A carrier that at least partially holds at least one container, the carrier comprising;

a plurality of panels at least partially extending around an interior of the carrier,
wherein the plurality of panels includes a first inclining top panel and a first side panel connected in a form of a hinge to the first inclining top panel along a lower edge of the first inclining top panel,
the carrier further comprises at least one container receiving mechanism extending at least in the first inclining top panel and a handle mechanism that allows the carrier to be lifted,
the at least one container receiving mechanism at least partially receives the at least one container,
the handle mechanism is so disposed that the at least one container receiving mechanism is disposed between the handle mechanism and the first side panel,
the at least one container receiving mechanism includes an upper receiving opening defined at least partially in the first inclining top panel,
the upper receiving opening is defined by a boundary containing a first edge and a second edge facing each other,
the first edge that defines the upper receiving opening is so disposed as to be closer to the handle mechanism than the second edge that defines the upper receiving opening, and
the first edge that defines the upper receiving opening has an arch-like shape in which a centre of curvature of the first edge is so located as to be closer to the second edge than to the first edge.

2. The carrier according to claim 1,

wherein the at least one container includes a flange and a top section extending upward beyond the flange,
the second edge, which defines the upper receiving opening, engages with at least part of the flange of the at least one container, and
the first edge, which defines the upper receiving opening, engages with at least part of the top section of the at

least one container.

3. The carrier according to claim 1, wherein the upper receiving opening extends to the first side panel in such a way that the first side panel provides the second edge, which defines the upper receiving opening.

4. The carrier according to claim 3, wherein the second edge, which defines the upper receiving opening, is curved.

5. The carrier according to claim 1,

wherein the carrier has a centre axial line so specified as to extend in parallel to a lower edge of the first inclining top panel,
the upper receiving opening has a first dimension (D2) extending in a direction perpendicular to the centre axial line, and
the first edge and the second edge, which define the upper receiving opening, face each other in the first dimension (D2) direction of the upper receiving opening.

6. The carrier according to claim 5, wherein the upper receiving openings has a second dimension (D1) extending in a direction parallel to the centre axial line, and the second dimension (D1) of the upper receiving opening is greater than the first dimension (D2) of the upper receiving opening.

7. The carrier according to claim 6, wherein the top section of the at least one container has a roughly cylindrical shape that specifies a diameter of the top section, and the second dimension (D1) of the upper receiving opening is greater than the diameter of the top section of the container.

8. The carrier according to claim 7, wherein the flange of the at least one container has a roughly ring-like shape that defines a diameter of the flange, and the second dimension (D1) of the upper receiving opening is greater than the diameter of the flange of the container.

9. The carrier according to claim 8, wherein the first dimension (D2) of the upper receiving opening is smaller than or equal to the diameter of the flange of the container.

10. The carrier according to claim 5, wherein the first dimension (D2) of the upper receiving opening is greater than or equal to 29 mm but smaller than or equal to 33 mm.

11. The carrier according to claim 1,

wherein the plurality of panels further includes a base panel connected in a form of a hinge to a lower edge of the first side panel,
the at least one container receiving mechanism includes a lower receiving opening that is defined at least partially in the base panel, and
when the at least one container is at least partially received by the at least one container receiving mechanism, a centre (*I*) of the lower receiving opening is not aligned in a vertical direction with a centre of curvature (*II*) of the first edge, which defines the upper receiving opening, and the centre (*I*) of the lower receiving opening is offset in a direction away from the first side panel from the centre of curvature (*II*) of the first edge, which defines the upper receiving opening.

12. The carrier according to claim 1,

wherein the plurality of panels further includes
a base panel connected in a form of a hinge to a lower edge of the first side panel,
a second side panel so connected in a form of a hinge to the base panel via a lower edge of the second side panel as to face the first side panel, and
a second inclining top panel connected in a form of a hinge to an upper edge of the second side panel and extending toward an upper edge of the first inclining top panel.

13. The carrier according to claim 12, wherein the handle mechanism includes at least one handle panel connected in a form of a hinge to the upper edge of the first inclining top panel.

14. A blank for forming the carrier according to any one of claims 1 to 13.

Fig. 1

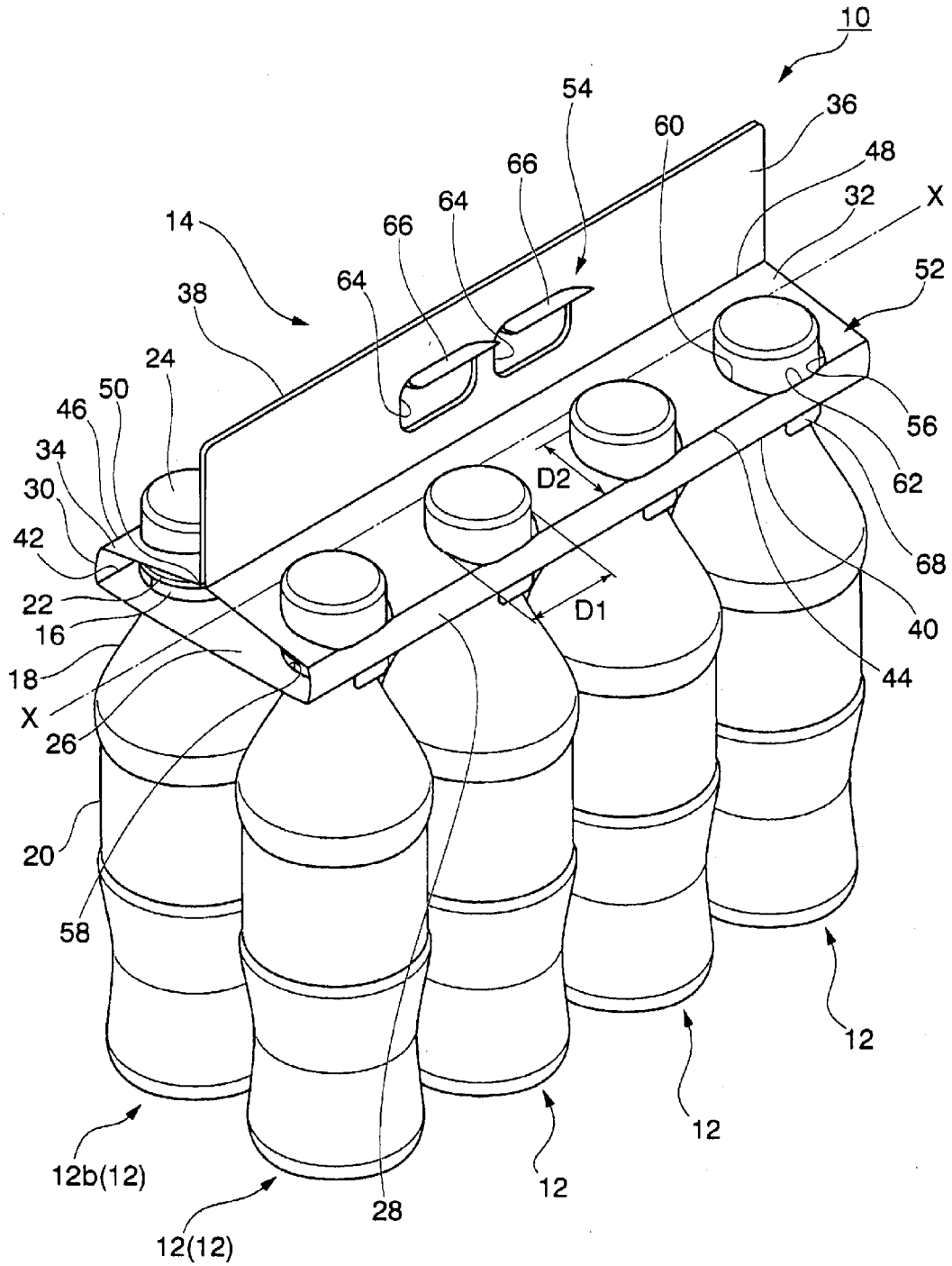

10
54
36
60
48
66
32
X
64
66
14
64
52
38
24
50
46
56
34
62
30
D2
42
68
22
D1
16
40
18
44
X
26
20
58
12
12
12
12b(12)
28
12(12)

Fig. 2

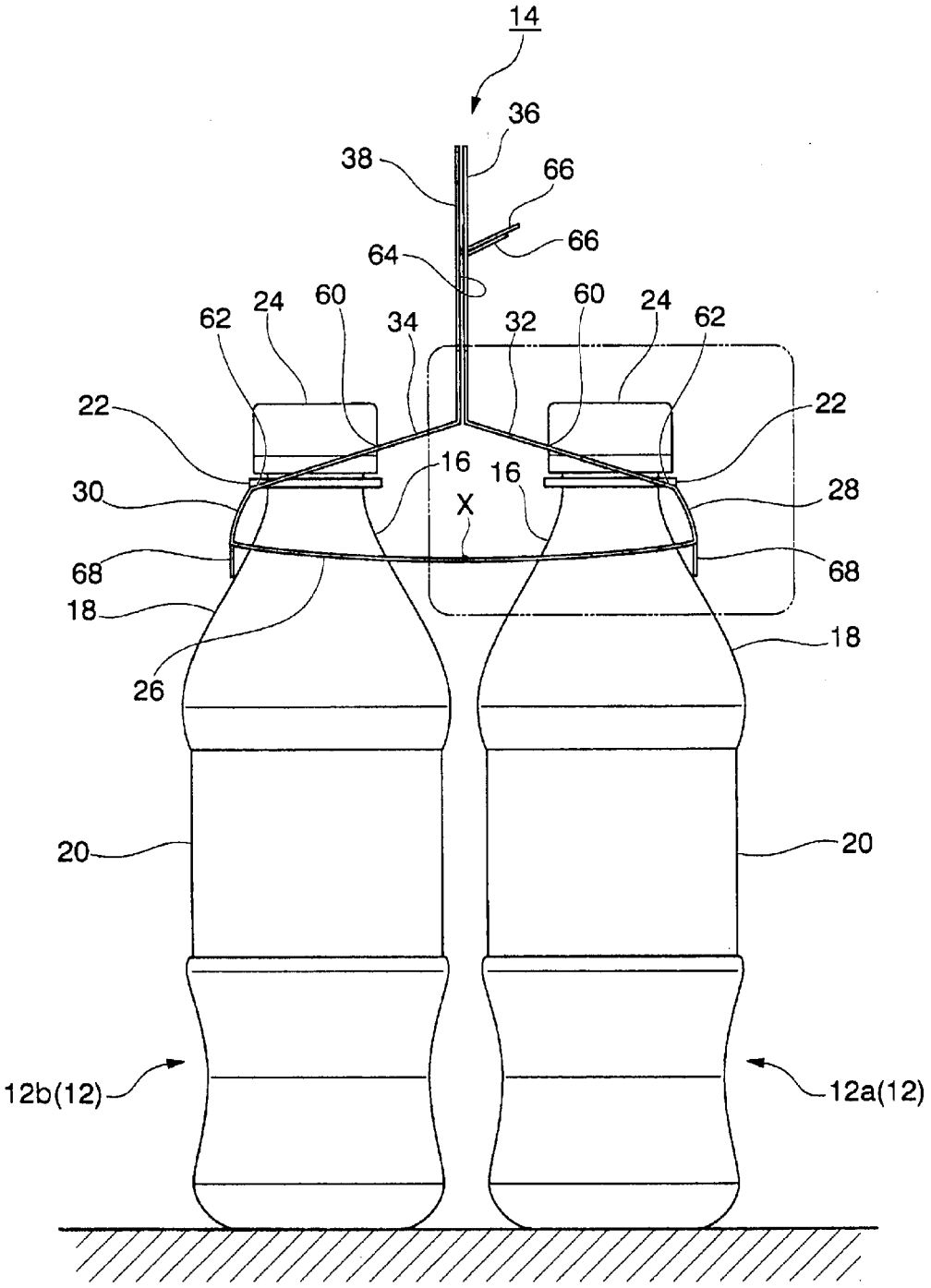

14
36
38
66
66
64
62
24
60
34
32
60
24
62
22
22
16
16
30
X
28
68
68
18
18
26
20
20
12b(12)
12a(12)

Fig. 3

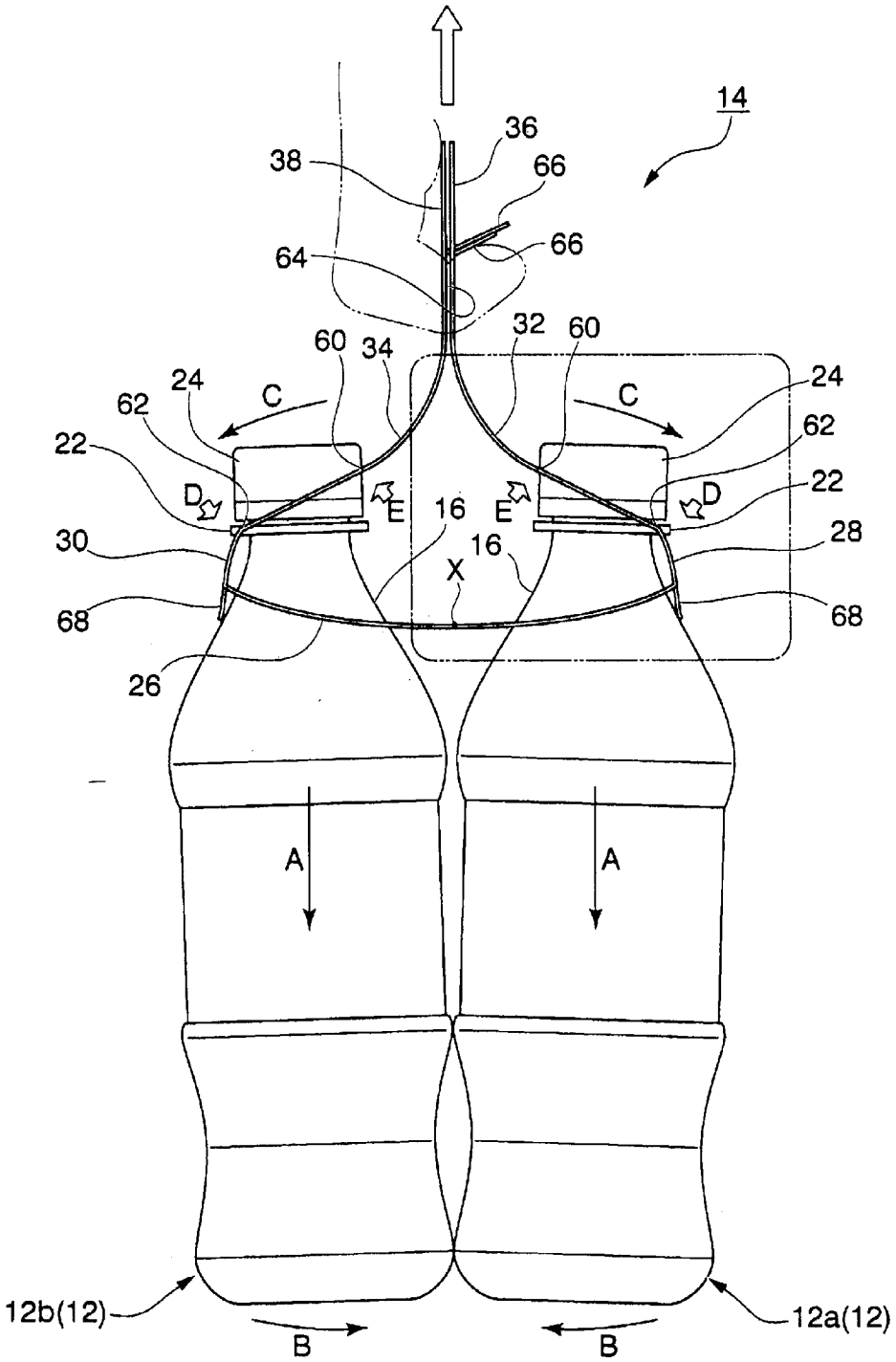

14
36
38
66
66
64
32
60
60
34
24
24
62
62
C
C
22
22
D
D
E
E
16
16
30
28
X
68
68
26
A
A
12b(12)
12a(12)
B
B

Fig. 4

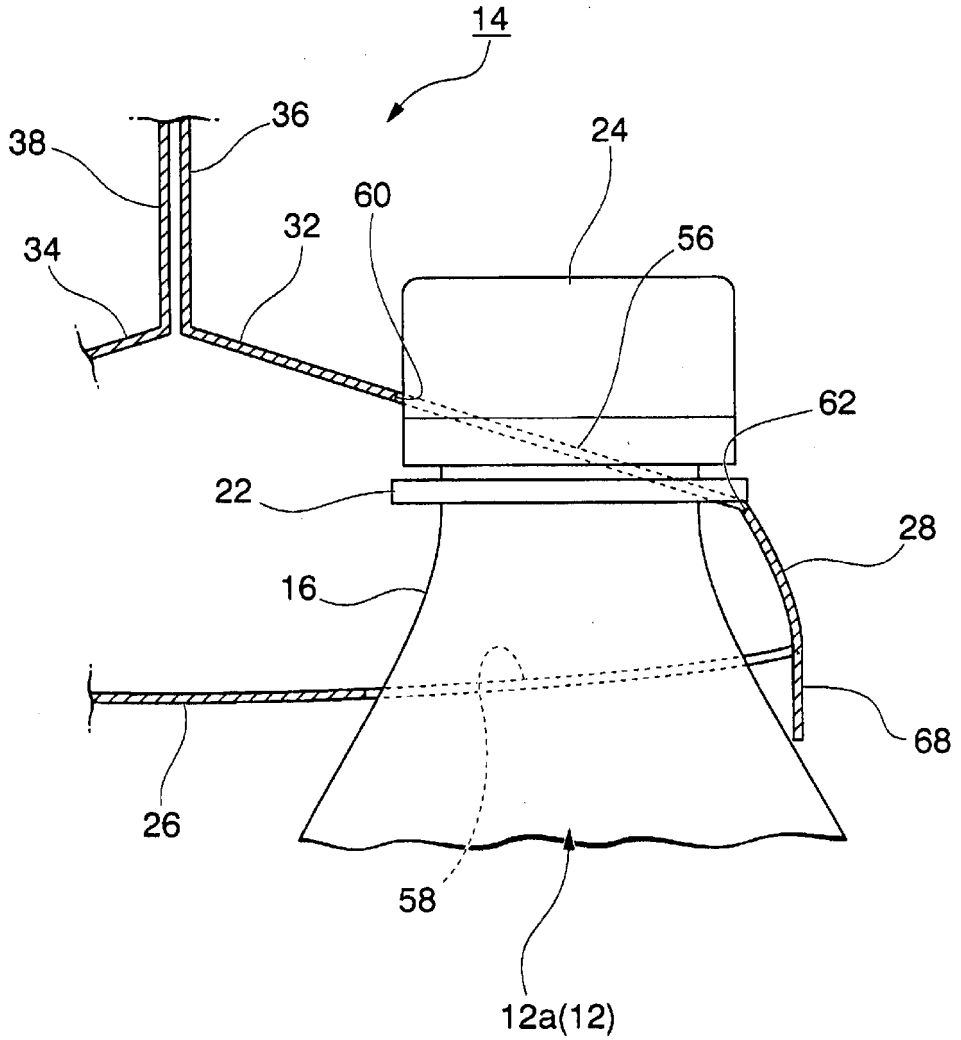


Fig. 5

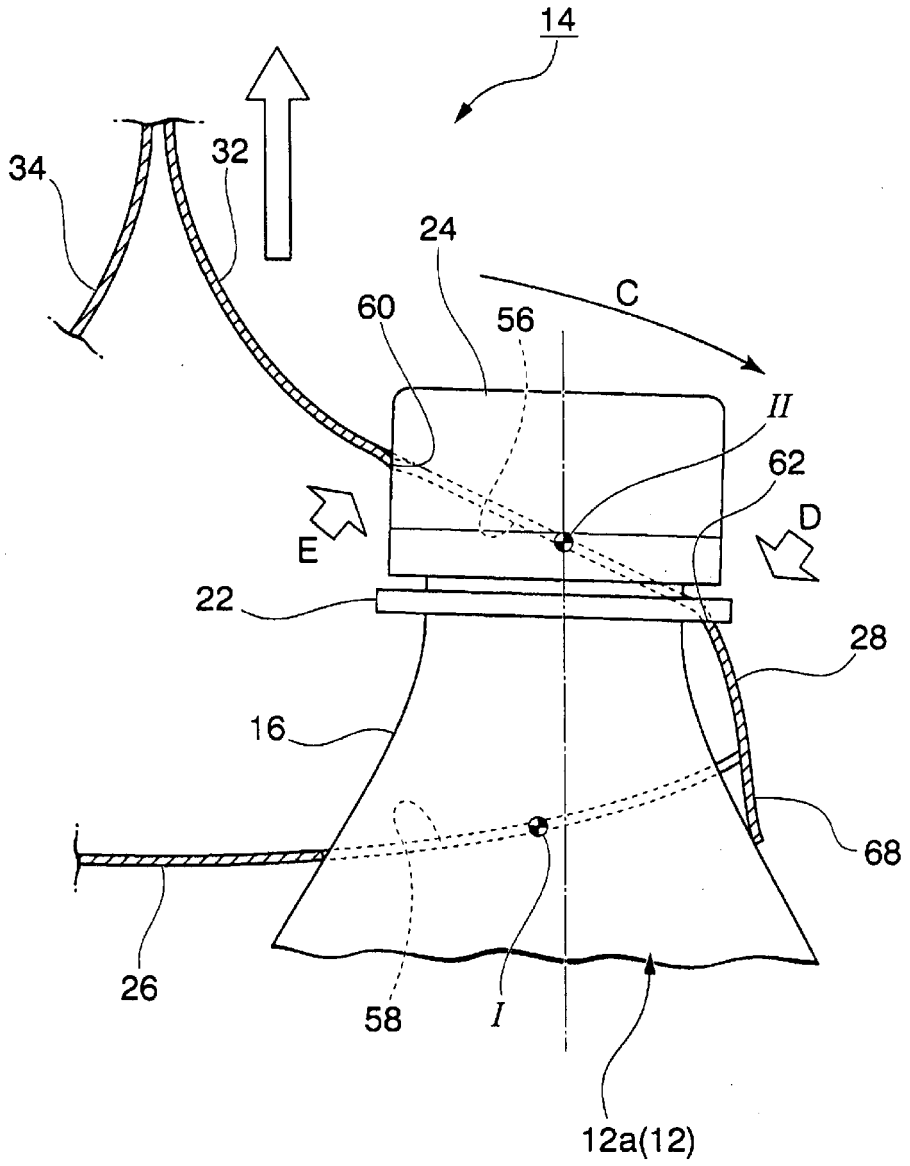


Fig. 6

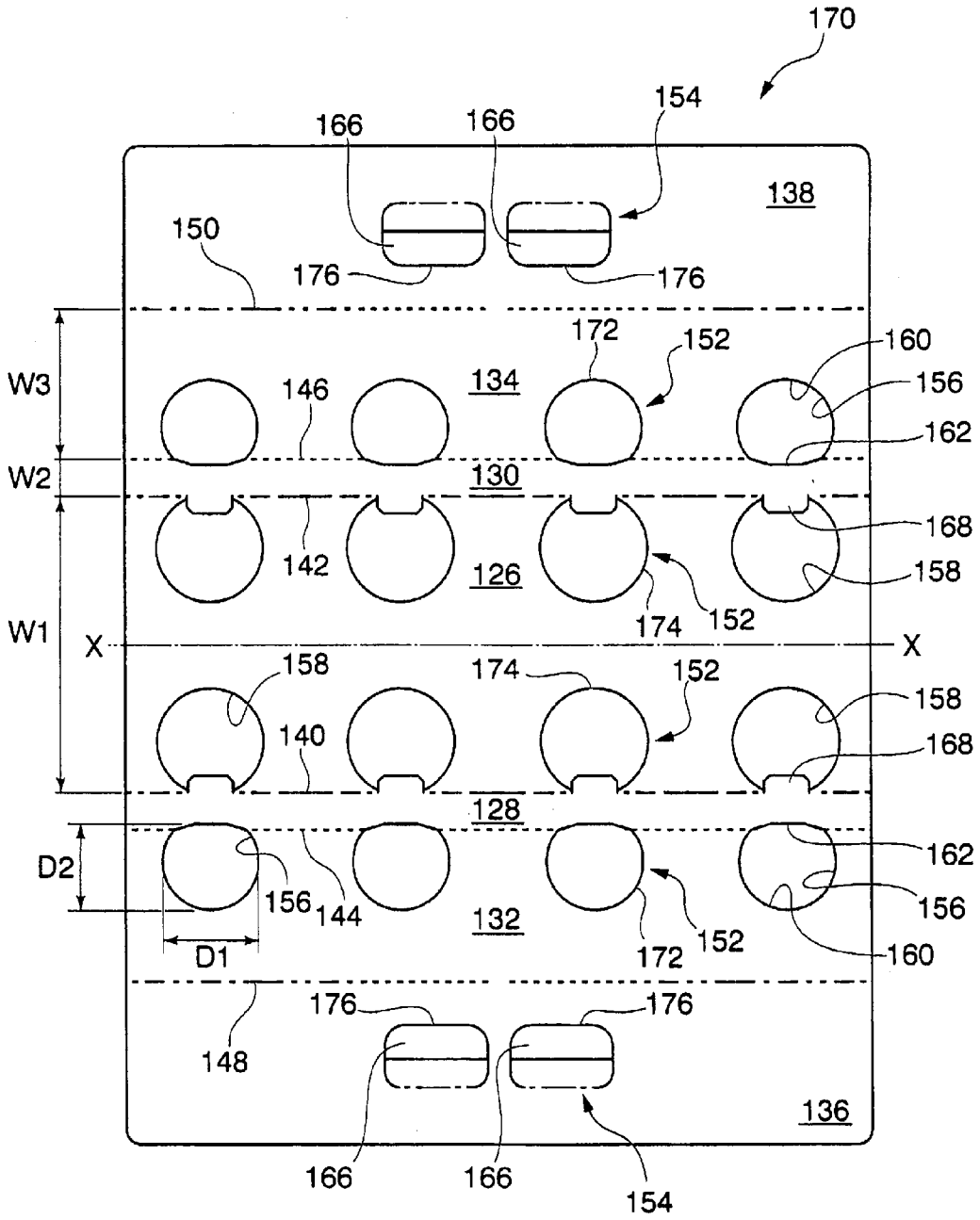
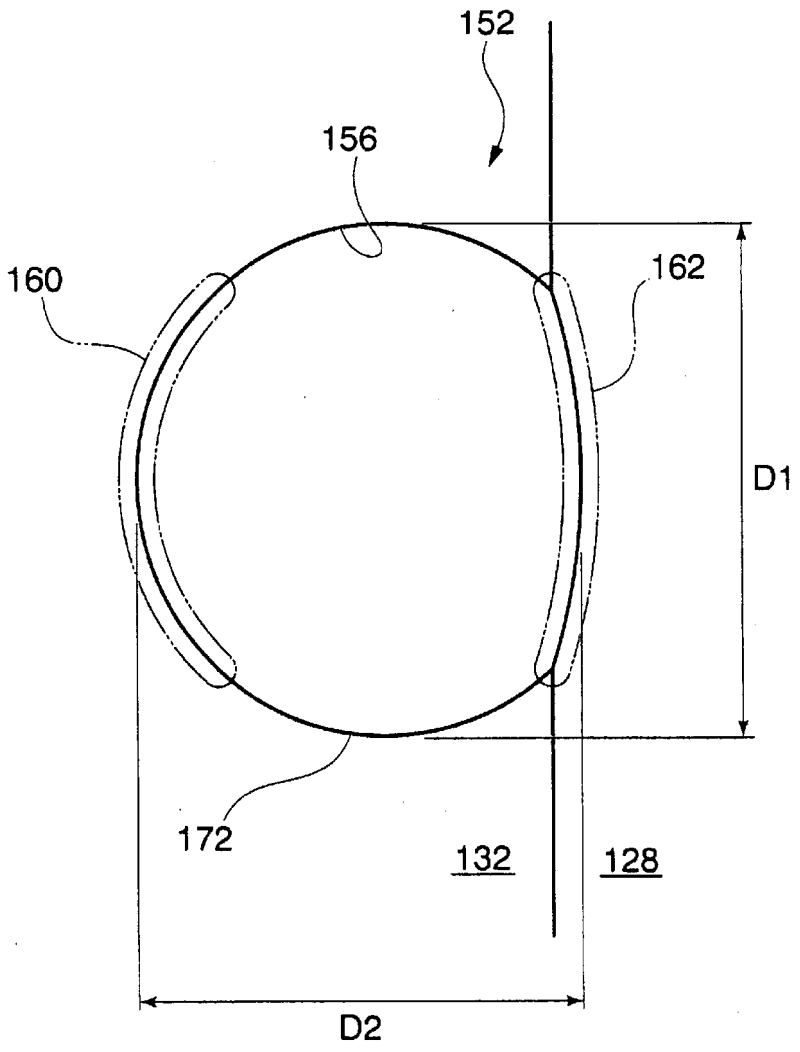

170
154
166
166
138
150
176
176
172
152
160
W3
146
134
156
162
W2
130
168
142
126
158
W1
X
174
152
X
158
174
152
158
140
168
128
D2
162
156
144
156
132
D1
172
152
160
176
176
148
136
166
166
154

Fig. 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/011454

A. CLASSIFICATION OF SUBJECT MATTER
B65D 71/46(2006.01)i
FI: B65D71/46

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)
B65D71/46

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	1971-2020
Registered utility model specifications of Japan	1996-2020
Published registered utility model applications of Japan	1994-2020

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.
X A	US 2330699 A (FLAMM, Alexander) 28.09.1943 (1943-09-28) fig. 1-4, page 1, right column, line 34 to page 3, right column, line 75	1, 5-14 2-4
A	US 2615750 A (O'SULUVAN, William L.) 28.10.1952 (1952-10-28)	1-14
A	US 4155502 A (CONSOLIDATED PACKAGING CORPORATION) 22.05.1979 (1979-05-22)	1-14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 April 2020 (01.04.2020)	14 April 2020 (14.04.2020)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/011454

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
US 2330699 A	28 Sep. 1943	(Family: none)	
US 2615750 A	28 Oct. 1952	(Family: none)	
US 4155502 A	22 May 1979	CA 1080669 A	

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 2019048447 A **[0001]**
- US 1292897 A **[0004]**
- WO 2005087609 A **[0004]**
- US 6082532 A **[0004]**
- EP 0889836 A **[0004]**
- US 5682982 A **[0004]**