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(54) PUNCH DIE FOR CARDBOARD BOX WITH TEAR STRIP

(57) A cutting die is proposed for producing a corrugated fiberboard box with a lower deficiency rate which can be easily opened by pulling tear strips.

The cutting die is used to produce a corrugated fiberboard in which wall portions 2 and horizontal wall portions 3 are integrally formed through ridge-forming rules 1. The fiberboard box also includes tear strips 7 for opening the box extending parallel to the ridge-forming lines 1, and their cut starting portions 8. Each tear strip 7 is defined by wavy cut lines 7a. Each cut line 7a is a lead rule including through cuts extending through the corrugated fiberboard from its back to front, and half cuts arranged alternately with the through cuts and extending from its back to a midpoint of the fiberboard in its thickness direction. The fiberboard is formed into a box by bending the vertical wall portions 2 and the horizontal wall portions 3 along the ridge-forming rules 1. The cutting die includes presser members 10 for forming the ridge-forming dies 1, and wavy lead rule blades 11 having alternately arranged high blade portions and low blade portions for forming the wavy cut lines 7a defining the tear strips 7. The cutting die is further provided with through cut-forming blades adjoined to the respective lead rule blades 11 for forming cuts 8a of the cut starting portions.

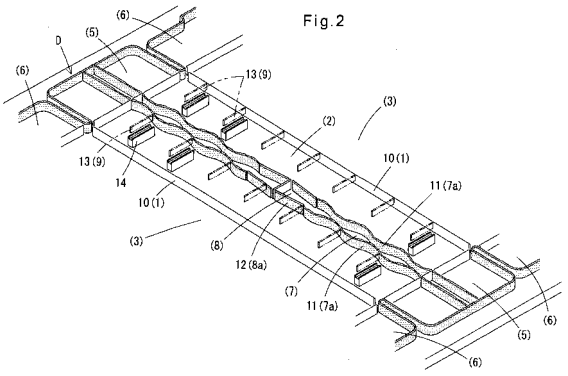


Fig. 2

EP 2 050 681 A1

Description

TECHNICAL FIELD

[0001] This invention relates to a cutting die for use in a die cutter for manufacturing corrugated fiberboard boxes having tear strips for opening the boxes.

[0002] Fig. 24 shows a conventional wrap-around corrugated fiberboard box formed by bending pairs of vertical wall portions 51 and horizontal wall portions 52 joined to the vertical wall portions 51 through ridge-forming rules 50, joining a joint flap 53 to one of the horizontal wall portions to form peripheral walls, with beverage cans C enclosed therein, and laminating together end flaps 54 and 55 extending from the vertical wall portions 51 and the horizontal wall portions 52, respectively, to seal the box.

[0003] Each vertical wall portion 51 has a tear strip 56 extending parallel to the ridge-forming rules 50. The end flaps 54 are also formed with tear strips 56 that are connected to the respective tear strips 56 of the respective vertical wall portions 51. At the center of each vertical wall portion 51, a cut starting portion 57 is formed, which can be picked up to start tearing of the strip 56 from this portion 57.

[0004] The tear strip 56 is defined by two opposed straight cut lines 56a. The cut lines 56a are formed by liner cutters that cut the back liner when forming a material corrugating fiberboard.

[0005] The cut lines 57a forming each cut starting portion 57 is a through cut formed when forming a blank by stamping the corrugated fiberboard by a through cut-forming blade provided on a cutting die so as to extend from the front to back of the fiberboard.

[0006] In order to open this corrugated fiberboard box, one of the cut starting portions 57 is pushed in and picked up, the tear strips 56 are pulled to separate the upper portions of the vertical wall portions 51 and end flaps 54 from their lower portions, and the upper portion of the box is removed, thereby exposing the cans C from the tray-shaped lower portion of the corrugated fiberboard box.

DISCLOSURE OF THE INVENTION

OBJECT OF THE INVENTION

[0007] When forming a corrugated fiberboard box of this type, the cut lines 56a defining the tear strips 56 tend to become out of alignment with the cut lines 57a defining the cut starting portions 57, thus making it difficult to smoothly open the box. Also, if the cuts are shallow, it may be impossible to cut the fiberboard along the cut lines 56a.

[0008] In order to avoid this problem, it is conceivable to form cut lines 56a in the form of half cuts when stamping the blank with half cut-forming blades provided on the cutting die. In this case, there is the possibility that the fiberboard may be bent not along the ridge-forming rules 50 but along the cut lines 56a when forming the box, thereby producing a defective box.

[0009] If a plurality of such fiberboard boxes are stacked one on another, under the loads of the upper boxes, the vertical wall portions of the lower boxes may bulge, which deteriorates the outer appearance of the boxes especially if the boxes are on display.

[0010] An object of the present invention is to provide a cutting die which can produce a corrugated fiberboard box which is not bent along the cut lines defining the tear strips when formed into the box, which can be easily opened by tearing the tear strips, and which is less likely to bulge when a plurality of them are stacked one on another.

MEANS TO ACHIEVE THE OBJECT

[0011] In order to achieve this object, the present invention provides a cutting die for a die cutter for forming a corrugated fiberboard box comprising vertical wall portions, horizontal wall portions connected to the vertical wall portions through ridge-forming rules, tear strips extending parallel to the ridge-forming rules for opening the box, cut starting portions from which the tear strips are cut, each of the tear strips being defined by wavy cut lines in the form of lead rules each comprising through cuts extending through the fiberboard forming the fiberboard box from front to back thereof, and half cuts extending from the back of the fiberboard to a midpoint of the fiberboard in the thickness direction of the fiberboard and arranged alternately with the through cuts, the vertical wall portions and the horizontal wall portions being bent relative to each other along the respective ridge-forming rules, characterized in that the cutting die comprise presser members for forming the ridge-forming rules, wavy lead rule blades for forming the respective wavy cut lines, each of the wavy lead rule blades comprising high blade portions and low blade portions arranged alternately with the high blade portions, and through cut-forming blades provided adjacent to the respective wavy lead rule blade for forming cuts defining the cut starting portions.

[0012] Each of the low blade portions of the lead rule blades has an inclined cutting edge. The low blade portions of each lead rule blade have cutting edges that are displaced from the cutting edges of the high blade portions of the same lead rule blade in the thickness direction of the lead rule blade.

ADVANTAGES OF THE INVENTION

[0013] For the corrugated fiberboard box formed by the above-described cutting die, since the cut lines defining the tear strips are wavy lines, and include half cuts provided between the adjacent through cuts and extend from the back of the fiberboard to a mid-point with respect to the thickness direction of the fiberboard, the cut lines

never act as hinges, so that the fiberboard is less likely to be bent inwardly when the fiberboard is formed into a box. Thus, the fiberboard can be bent precisely along the ridge-forming rules between the vertical wall portions and the horizontal wall portions, which in turn makes it possible to reduce the number of deficient boxes.

[0014] When the fiberboard is formed into a box, because the cut lines defining the respective tear strips and the cut starting portions are formed by a single common cutting die, the cut lines defining the tear strips and the cut starting portions can be formed exactly in a predetermined positional relationship to each other. Thus, by pulling the tear strips from the cut starting portions, the half cut portions are smoothly cut apart, so that the fiberboard box can be easily opened.

[0015] Further, since the cut lines formed in the vertical wall portions are wavy lines, and ribs are formed by pressing the fiberboard from its front toward its back, the fiberboard box is prevented from bulging when other boxes are stacked thereon. This improves the outer appearance of the box when on display.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Fig. 1 is a rear plan view of a blank of a corrugated fiberboard box according to a first embodiment of the present invention.
Fig. 2 is a perspective view of a portion of a cutting die for forming the blank of Fig. 1.
Fig. 3 is an enlarged perspective view showing the relationship between a lead rule blade and the corresponding cuts.
Fig. 4 is a schematic sectional view showing how the lead rule blade cuts into the fiberboard.
Fig. 5 is a schematic sectional view showing how the fiberboard is pressed by a presser member and a support member.
Fig. 6 shows the direction in which ribs allow the fiberboard to be bent.
Fig. 7 is a perspective view of the above-mentioned corrugated fiberboard box, showing its erected and sealed state.
Fig. 8 is a partial perspective view of the fiberboard showing how it is formed into a box.
Fig. 9 is a perspective view of a corrugated fiberboard box according to a second embodiment of the present invention, showing its erected and sealed state.
Fig. 10 is a perspective view of a corrugated fiberboard box according to a third embodiment of the present invention, showing its erected and sealed state.
Figs. 11(a) to 11(d) show different lead rule blades.
Fig. 12 is a schematic sectional view of a lead rule blade of which the low blade portions are displaced from the high blade portions.
Fig. 13 is a schematic view of a cut line of which the half cuts are displaced from the through cuts.
Fig. 14 is an enlarged detailed view of basic wavy cut lines.
Fig. 15 is an enlarged detailed view of an upright wall portion formed with different wavy cut lines.
Fig. 16 is an enlarged detailed view of still different wavy cut lines.
Fig. 17 is an enlarged detailed view of still different wavy cut lines.
Fig. 18 is partial rear plan view of a blank formed with different cut lines.
Fig. 19 is a partial rear plan view of a blank formed with a different tear strip.
Fig. 20 is a partial rear plan view of a blank formed with different ribs in the form of rules.
Fig. 21 is a partial rear plan view of a blank having ribs formed by crushing flutes of the fiberboard.
Fig. 22 is a partial rear plan view of a blank having different ribs formed by crushing flutes of the fiberboard.
Fig. 23 is a schematic sectional view of a cutting die for forming a blank with ribs formed by crushing flutes of the fiberboard.
Fig. 24 is a perspective view of a conventional corrugated fiberboard box showing its erected and sealed state.

DESCRIPTION OF THE NUMERALS

[0017]

1. Ridge-forming rule
2. Vertical wall portion
3. Horizontal wall portion
4. Joint flap
5, 6. End flap
7. Tear strip
7a. Cut line
7b. Through cut
7c. Half cut
7d. Uncut portion
8. Cut starting portion
8a. Cut
9. Rib
10. Presser member
11. Lead rule blade
11a. High blade portion
11b. Low blade portion
11c. Recess
12. Through cut-forming blade
13. Presser member
14. Support member
15. Support member
16. Cutting plate
17. Cutting blade
18. Presser member
D. Cutting die

U. Face plate
S. Sheet

BEST MODE FOR EMBODYING THE INVENTION

[0018] Now the embodiments of this invention are described with reference to the accompanying drawings.

[0019] This corrugated fiberboard box is of the wrap-around type for packaging 24 beverage cans in six rows and four columns, and is formed from a blank shown in Fig. 1. This blank comprises a pair of vertical wall portions 2 and a pair of horizontal wall portions 3 arranged alternately with the vertical wall portions 2 and integrally connected to the adjacent vertical wall portions 2 through ridge-forming rules 1. A joint flap 4 is integrally connected to one of the vertical wall portions 2 through a ridge-forming rule 1. End flaps 5 and 6 are integrally connected to the ends of the vertical wall portions 2 and horizontal wall portions 3, respectively.

[0020] The vertical wall portions 2 each have a tear strip 7 for opening the box which extends parallel to the ridge-forming rules 1 from one to the other end edge of the vertical wall portion 2. At the center of the vertical wall portion 2, a cut starting portion 8 is provided which can be picked up to start tearing of the strip 7 from this portion 8.

[0021] The vertical wall portions 2 each have a tear strip 7 defined by two periodically curved symmetrical cut lines 7a. The cut lines 7a are lead rules comprising through cuts 7b that extend through the fiberboard in its thickness direction, half cuts 7c arranged alternately with the through cuts 7b and extending from the back of the fiberboard to a midpoint of the thickness of the fiberboard, and uncut portions 7d disposed between the through cuts 7b and the half cuts 7c.

[0022] As shown in Fig. 14, a through cut 7b is formed at each apex of each cut line 7a where the tear strip 7 is the widest and the distance between the cut line 7a and the ridge-forming rule 1 is the shortest, and another through cut 7b is formed at each apex of each cut line 7a where the tear strip 7 is the narrowest and the distance between the cut line 7a and the ridge-forming rule 1 is the longest. The through cuts 7b are longer than the half cuts 7c.

[0023] The wavelength A of the cut lines is preferably set to a value within the range of 40 to 80 mm according to the size and material of the box, and equal to the diameter of cans. The wave height B is preferably 5 to 15 mm with the narrowest width C of the tear strip 7 set at 10 to 20 mm. Alternatively, the wavelength A, wave height B and width C for each cycle of the cut lines may be different from those for other cycles.

[0024] As shown in Fig. 1, which shows the blank, the portions of the cut lines defining each tear strip 7 that extends across the ridge between the vertical wall portion 2 and the end flap 5 are through cuts. The portions of the cut lines defining the tear strips 7 present in each end flap 5 are a combination of half cuts extending from the back of the fiberboards and through cuts.

[0025] Each cut starting portion 8 comprises through cuts 8a extending from front to back of the fiberboard and has substantially the shape of the letter H corresponding to the wavy shape of the tear strip.

[0026] A plurality of ribs 9 are formed on each vertical wall portion 2 that extend in the direction perpendicular to the ridge-forming rules 1 and parallel to the flutes of the fiberboard and parallel to each other. The ribs 9 are formed by pressing the fiberboard from its front so as to protrude from its back. The ribs 9 are arranged outside the tear strip 7 so that their extensions intersect the cut lines 7a of the tear strip at their apexes where the distance between each cut line 7a and the ridge-forming rule 1 is the shortest.

[0027] A cutting die D for forming the above-described corrugated fiberboard box is shown in Fig. 2, which includes presser members 10 in the form of linear strips for forming the ridge-forming rules 1 between the vertical wall portions 2 and the horizontal wall portions 1, wavy lead rule blades 11 extending substantially parallel to the presser members 10 for forming the cut lines 7a defining the tear strips 7, and through cut-forming blades 12 connected to the respective lead rule blades for forming the cuts 8a of the cut starting portion 8.

[0028] As shown in Figs. 2 and 5, on a faceplate U for supporting the front of the blank sheet S during die cutting, presser members 13 for forming the ribs 9 are provided which are in the form of linear strips extending in the direction perpendicular to the presser members 10 of the cutting die D for a die cutter and arranged such that their extensions intersect the lead rule blades 11 at their apexes where the distance between each rule blade 11 and the presser member 10 is the shortest. The cutting die D has support members 14 for loosely receiving the free edges of the respective presser members 13.

[0029] As shown in Fig. 3, each lead rule blade has a cutting portion comprising high blade portions 11a, low blade portions 11b arranged alternately with the high blade portions 11a, and recesses 11c provided between the respective high blade portions 11a and the low blade portions 11b adjacent to the respective high blade portions 11a.

[0030] During die cutting of the blank sheet S using this cutting die, as shown in Figs. 3 and 4, the high blade portions 11a of the lead rule blades 11 penetrate through the sheet S, which is supported on a support member 15 made of e.g. cork, from its back to front, while the low blade portions 11b cut into the sheet S from its back to a midpoint of its thickness, thus forming the through cuts 7b and the half cuts 7c of the cut lines 7a, respectively.

[0031] The recesses 11c never cut into the sheet S, so that the uncut portions 7d are defined between the respective through cuts 7b and the adjacent half cuts 7c. The uncut portions 7d reduce the possibility of buckling of the sheet S along the cut liens 7a.

[0032] During die cutting, as shown in Fig. 5, with the back of the sheet S supported by the support members

14, the presser members 13 are pressed against the sheet from its front, so that the ribs 9 are formed on its front and recesses are formed in the back of the respective ribs 9.

[0033] Once the ribs 9 are formed, as shown in Fig. 6, the sheet S can be bent more easily in the direction toward the recesses formed in the back of the ribs 9 than in the direction toward the ribs 9.

[0034] The cutting die for forming the curved cut lines 7a and the ribs 9 may be used in a flat die cutter or a rotary die cutter.

[0035] When packaging beverage cans in a box formed by erecting the thus formed blank, using a wrap-around caser, as shown in Fig. 7, the pairs of vertical wall portions 2 and horizontal wall portions 3 are bent relative to each other along the ridge-forming rules 1, and the joint flap 2 is joined to one of the horizontal wall portions 3 to define peripheral walls, with beverage cans enclosed there. Then, the end flaps 5 and 6 are laminated together to seal the box.

[0036] As is apparent from Fig. 8, because the cut lines 7a defining the tear strips 7 have wave shapes, and because the half cuts 7c formed between the adjacent through cuts 7b extend from the back of the fiberboard, the cut lines 7a do not act as hinges, so that the fiberboard is less likely to be bent inwardly along the cut lines 7a when the blank is bent into a fiberboard box. Thus, the fiberboard is bent only along the ridge-forming rules 1 between the vertical wall portions 2 and the horizontal wall portions 3. This minimizes defective boxes.

[0037] When forming the corrugated fiberboard box, the cut lines 7a of the tear strips 7 and the cut lines 8a of the cut starting portions 8 are formed simultaneously using the single common cutting die. Thus, they can be formed with their positional relationships maintained exactly as required. This in turn makes it possible to markedly reduce the defective rate compared to conventional methods in which the cuts 8a are formed by a die cutter after cutting the liner with a corrugator.

[0038] When opening the box, by pulling the tear strips 7 from one of the cutting start portions 8, the tear strips are never torn apart, thereby making it impossible to open the box, as in the case with conventional boxes, in which cut lines are formed by cutting the liner. Instead, by pulling the tear strips 7, the strips 7 separate from the other portion of the fiberboard along the half cuts 7c such that the through cuts 7a are connected to each other. The box can thus be easily opened.

[0039] When the box is opened, the vertical wall portions are cut along the cut lines 7a without being irregularly torn apart. Because the cut lines have a wavy pattern, they make an elegant impression.

[0040] During transportation, a plurality of such fiberboard boxes are stacked one on top of another, so that loads of upper boxes act on lower boxes. But the ribs 9, which are formed on the fiberboard so as to bulge from its front to back, make it more difficult for the vertical wall portions to bulge, thereby preventing the box from bulging even if other boxes are stacked thereon.

[0041] The fact that each tear strip 7 is defined by two symmetrical wavy cut lines 7a also contributes to the prevention of bending and bulging of the vertical wall portions 2 when forming the box.

[0042] In the above-described embodiment, in order to effectively prevent the fiberboard from being bent along the cut lines 7a, the ribs 9 are provided such that their extensions intersect the apexes of the corresponding cut line 7a where the distance between the cut line and the ridge-forming rule 1 is the shortest. But instead, as shown in Fig. 9, the ribs 9 may be provided such that their extensions intersect the apexes of the corresponding cut line 7a where the distance between the cut line and the ridge-forming rule 1 is the longest. With this arrangement, since the ribs 9 are longer, it is possible to more effectively prevent bulging of the box.

[0043] As shown in Fig. 10, additional ribs 9 may be formed that are provided outside the tear strips 7 and extend parallel to the ridge-forming rules 1. Such additional ribs 9 prevent the vertical wall portions 2 from being bent outwardly along the horizontal line, while allowing the vertical wall portions 2 only inwardly. This further effectively prevents bulging of the box.

[0044] In order to further effectively prevent bulging of the box, additional ribs 9 may be formed on the tear strips 7. But in this case, when pulling the tear strips 7, the tear strips 7 may be bent along these additional ribs 9, making it difficult to further pull the tear strips. Thus, if it is important to easily open the box, such additional ribs 9 should be omitted. Also, if a thick fiberboard having sufficient strength is used, the ribs 9 may be entirely omitted.

[0045] As specific lead rule blades 11 for the cutting die shown in Fig. 2, which are used to form the cut lines 7a defining the tear strips 7 of the corrugated fiberboard of each embodiment, those shown in Figs. 11(a) to 11 (d) may be used, of which the low blade portions 11b each have an inclined cutting edge. With this arrangement, the cutting edge of each low blade portions 11b gradually cuts into the fiberboard from its highest point toward lowest point. This prevents the fiberboard from being pressed hard and crushed by the low blade portions, which in turn more effectively prevents the fiberboard from being bent at unintended portions when formed into a box, and prevents bulging of the box when other boxes are stacked thereon.

[0046] Specifically, the low blade portion 11b shown in Fig. 11(a) has a convex cutting edge, which is the highest at its mid-point, the low blade portion 11b shown in Fig. 11(b) has a concave portion 11(b), which is the lowest at its mid-point, and the low blade portion 11b shown in Fig. 11(c) has a cutting edge inclined from one toward the other end thereof. The low blade portion 11b shown in Fig. 11(d) has a cutting edge comprising a plurality of convex and concave portions. Also, the cutting edge of each low blade portion may have an arcuate or wavy shape. If the uncut portions 7d are not necessary, the recesses 11c may be omitted.

[0047] As shown in Fig. 12, the low blade portions 11b of each lead rule blade 11 may have their cutting edges displaced from the cutting edges of the high blade portions 11a in the thickness direction of the blade.

[0048] By using such lead rule blade 11, as shown in Fig. 13, the half cuts 7c of each cut line 7a are displaced from the extensions of the through cuts 7b, so that it is possible to increase the resistance to bending by increasing the length of the uncut portions 7d, or to reliably cut the fiberboard along the cut lines 7a without interruption by displacing the half cuts 7a in a direction in which the actual cut tends to deviate from the cut line 7a.

[0049] As shown in Fig. 15, in order to improve the outer appearance of the box after removing the top, the upper and lower cut lines 7a and the cut starting portions 8 may be arranged to form continuous sine waves. Also, the through cuts 7b of the lower cut line 7a that extend toward the narrow portions of the tear strip 7 may be longer than the other through cuts so as to prevent the actual cut from deviating outwardly from the cut lines at these portions. Also, the half cuts 7b at these portions may be omitted so that the adjacent through cuts 7b are connected together only through the uncut portions and not through the half cuts 7c.

[0050] In any of the above embodiments, the cut lines 7a are curved in the shape of sine waves. But as shown in Fig. 16, the cut lines 7a may be in the shape of triangular waves with their inclined portions extending in straight lines. Also as shown in Fig. 17, the cut lines 7a may trapezoidal with their apexes flattened within narrow ranges. In this case, in order that the tear strips 7 can be easily torn, a through cut 7b should be located at every apex of the waves. Such a through cut 7b should be curves so as to smoothly connect to the half cuts 7c on both sides thereof.

[0051] In any of the above embodiments, the upper and lower cut lines 7a are of the same type. But they may not be of the same type. For example, the tear strips 7 may be defined by upper and lower cut lines selected from two of sine, triangular and trapezoidal waves.

[0052] In any of the above embodiments, the tear strips 7 have wide portions and narrow portions that are provided alternately with the wide portions. But instead, as shown in Fig. 18, the upper and lower cut lines 7a may be arranged in phase with each other so that the tear strips 7 have a uniform width over the entire length thereof.

[0053] In any of the above embodiments, the upper and lower cut lines 7a are both wave forms. But instead, as shown in Fig. 19, only the lower cut line 7a, which remains after removing the top for display, may be of a waveform, with the upper cut line 7e extending obliquely upwardly from the cutting start portion 8 to the ridge-forming rule 1 and then extending along the ridge-forming rule 1. In this case, the upper cut line 7e is preferably in the form of a zipper comprising discontinuous hook-shaped cuts or comprise a half cut.

[0054] In any of the embodiments, the ribs 9 for preventing bulging of the box are vertical lines. But instead, as shown in Fig. 20, each rib 9 may have an inclined portion so that, for example, they indicate the contours of the cans inside.

[0055] Instead of the ribs 9 of the above embodiments, which are in the form of rules, as shown in Figs. 21 and 22, ribs 9 having a predetermined area are formed by crushing and flattening the corrugating medium of the fiberboard so that, for example, one can imagine how the cans are held in the box.

[0056] A blank having such ribs can be formed using the tool shown in Fig. 23. This tool comprises a face plate U, a cutting plate 16 fixed to the face plate U, flat presser members 13 made of e.g. a hard plastic or a metal and mounted on the cutting plate 16, and a cutting die D having cutting blades 17 for forming through cuts, presser members 18 for forming auxiliary rules, and support members 14 made of a slightly elastic material such as cork and having pressure-receiving surfaces facing the presser members 13. By compressing a fiberboard sheet S between the presser members 13 and the support members 14, the ribs 9 are clearly formed.

[0057] As shown in Fig. 22, a rule may be further formed on each rib 9 formed by crushing the fiberboard.

[0058] In any of the embodiments, a corrugated fiberboard box in the form of a rectangular parallelepiped is formed by bending the fiberboard at a right angle along the respective ridges. But instead, a box having an octagonal cross-section may be formed by forming a chamfer along each ridge. Such a box may have all the features of the above embodiments.

[0059] In any of the embodiments, a tear strip 7 is formed in each vertical wall portion 2. But instead, a tear strip 7 may be formed in each horizontal wall portion 3.

[0060] Any of the embodiments is directed to a wrap-around corrugated fiberboard box. But the tear strips and/or ribs disclosed above may be provided on a grooved corrugated fiberboard box which comprises a vertical wall portions connected to each other, upper horizontal flaps each extending from the upper edge of one of the vertical wall portions, and lower horizontal flaps each extending from the lower edge of one of the vertical wall portions. The upper horizontal flaps and the lower horizontal flaps are respectively superposed one on top of another to seal the box. In this case, a plurality of tear strips may be formed in each vertical wall portion that are arranged one over another and extending parallel to each other so that the box can be opened at different heights.

Claims

1. A cutting die for a die cutter for forming a corrugated fiberboard box comprising vertical wall portions (2), horizontal wall portions (3) connected to the vertical wall portions (2) through ridge-forming rules (1), tear strips (7) extending parallel to said ridge-forming rules (1) for opening the box, cut starting portions (8)

from which the tear strips (7) are cut, each of said tear strips (7) being defined by wavy cut lines (7a) in the form of lead rules each comprising through cuts (7b) extending through the fiberboard forming the fiberboard box from front to back thereof, and half cuts (7c) extending from the back of the fiberboard to a midpoint of the fiberboard in the thickness direction of the fiberboard and arranged alternately with the through cuts (7b), said vertical wall portions (2) and said horizontal wall portions (3) being bent relative to each other along the respective ridge-forming rules (1),
characterized in that said cutting die comprise presser members (10) for forming said ridge-forming rules (1), wavy lead rule blades (11) for forming the respective wavy cut lines (7a), each of said wavy lead rule blades (11) comprising high blade portions (11a) and low blade portions (11b) arranged alternately with the high blade portions (11a), and through cut-forming blades (12) provided adjacent to the respective wavy lead rule blade (11) for forming cuts (8a) defining said cut starting portions (8).

2. The cutting die of claim 1 wherein each of said low blade portions (11b) of the lead rule blades (11) has an inclined cutting edge.

3. The cutting die of claim 1 or 2 wherein said low blade portions (11b) of each lead rule blade (11) have cutting edges that are displaced from cutting edges of the high blade portions (11a) of the same lead rule blade (11) in the thickness direction of the lead rule blade.

Fig.1

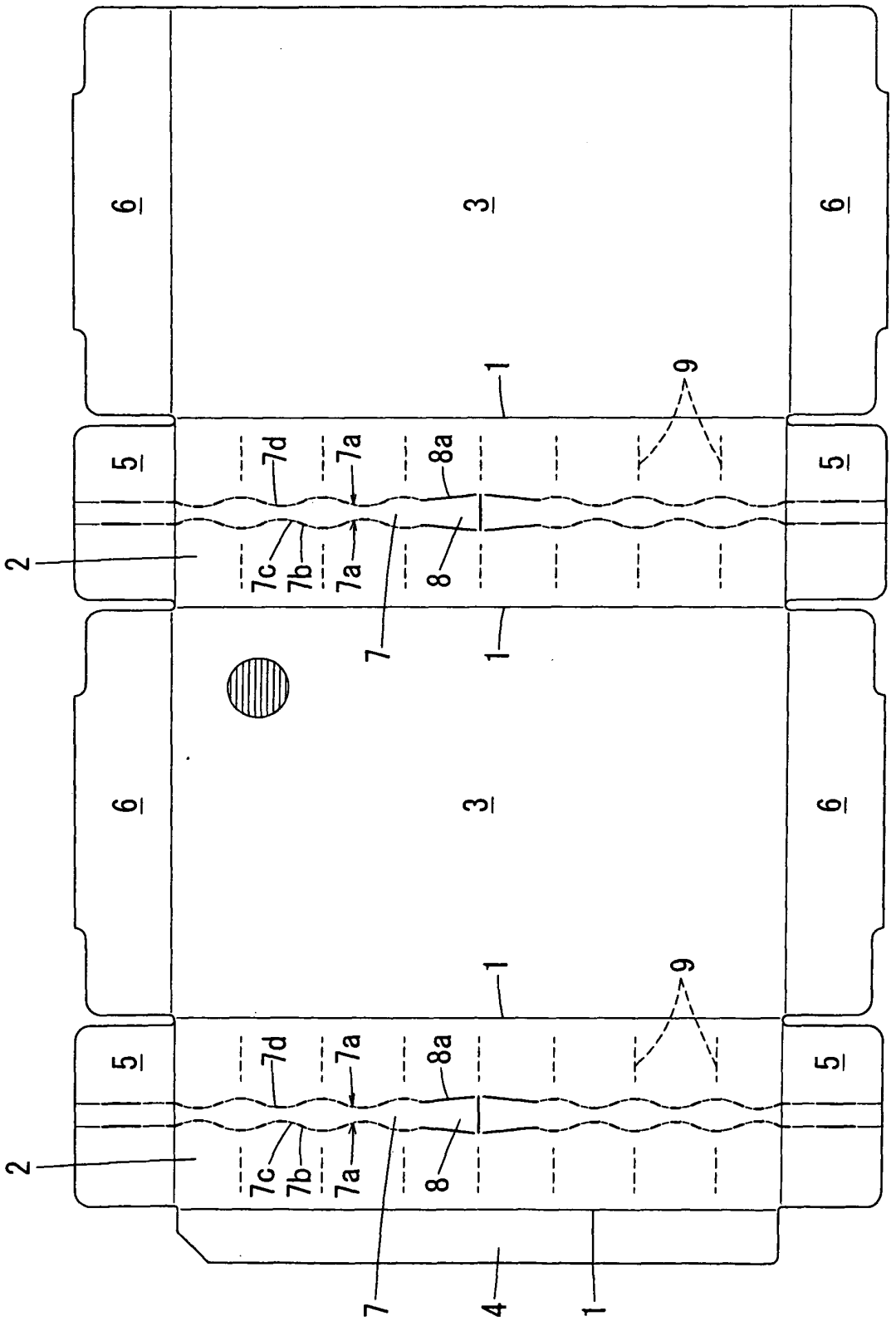


Fig.2

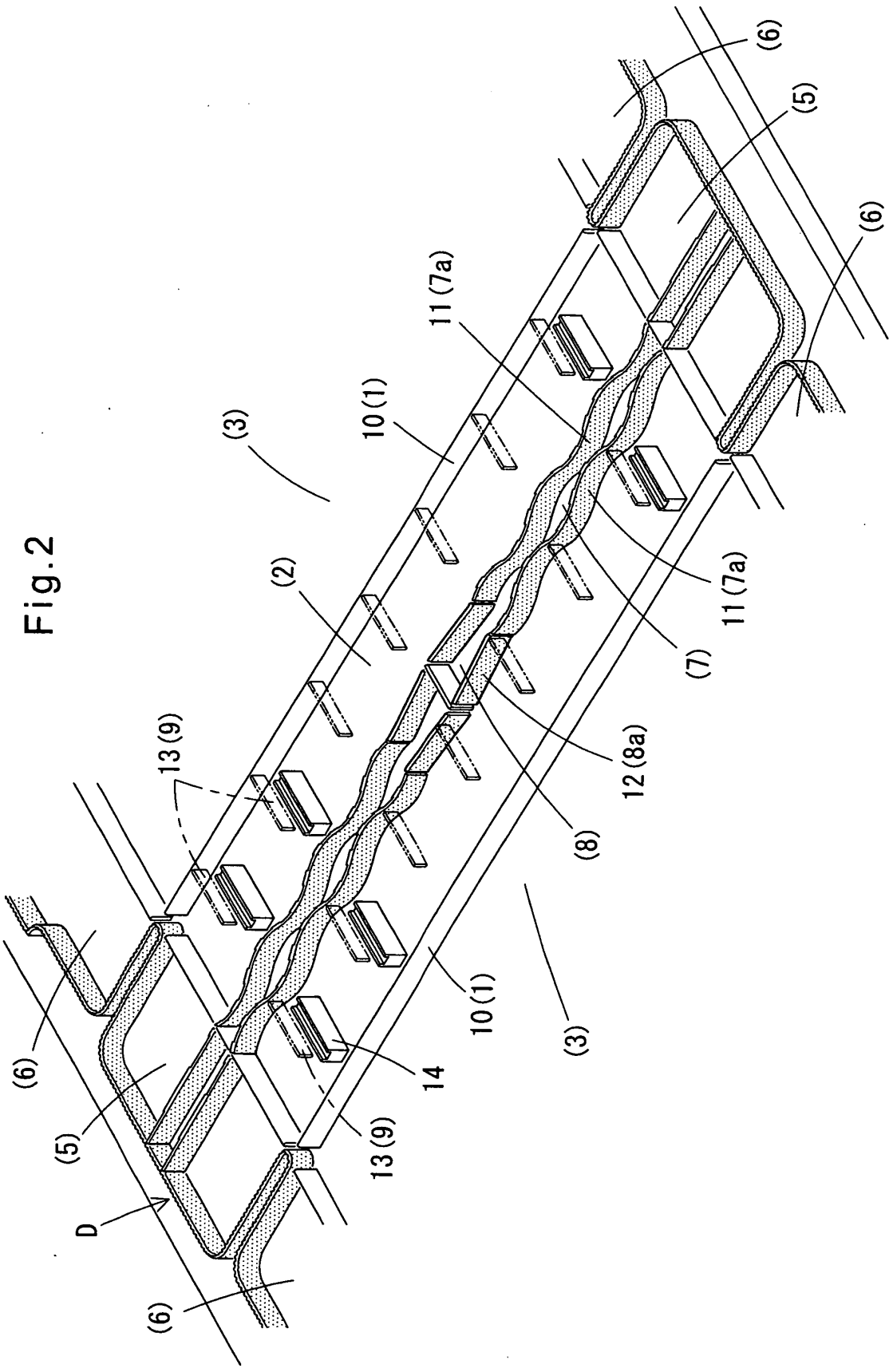


Fig.3

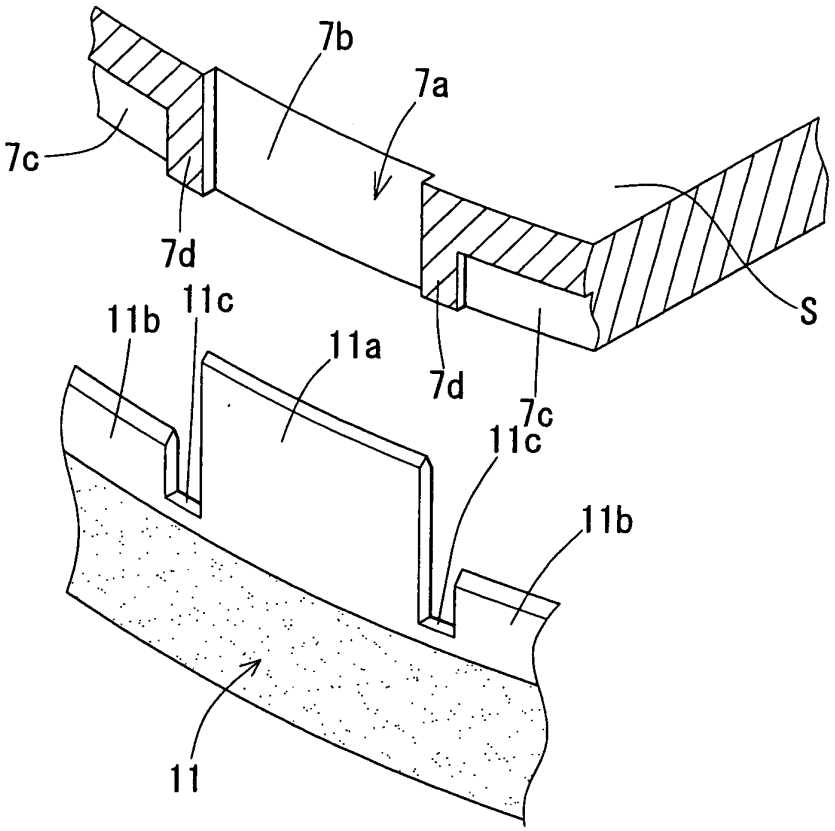


Fig.4

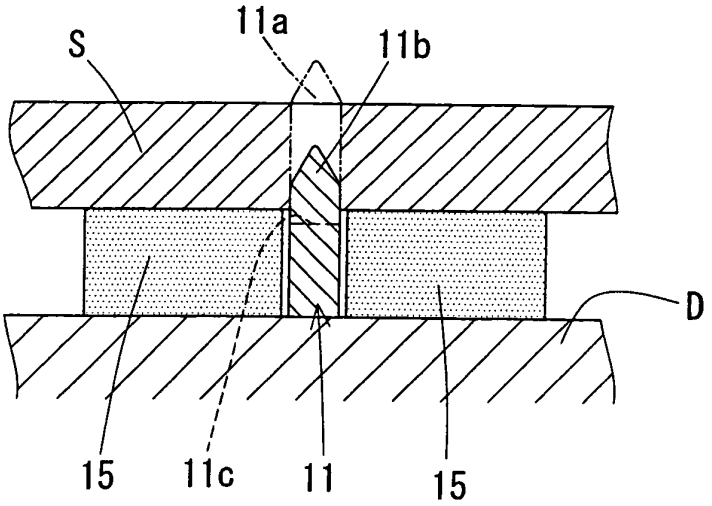
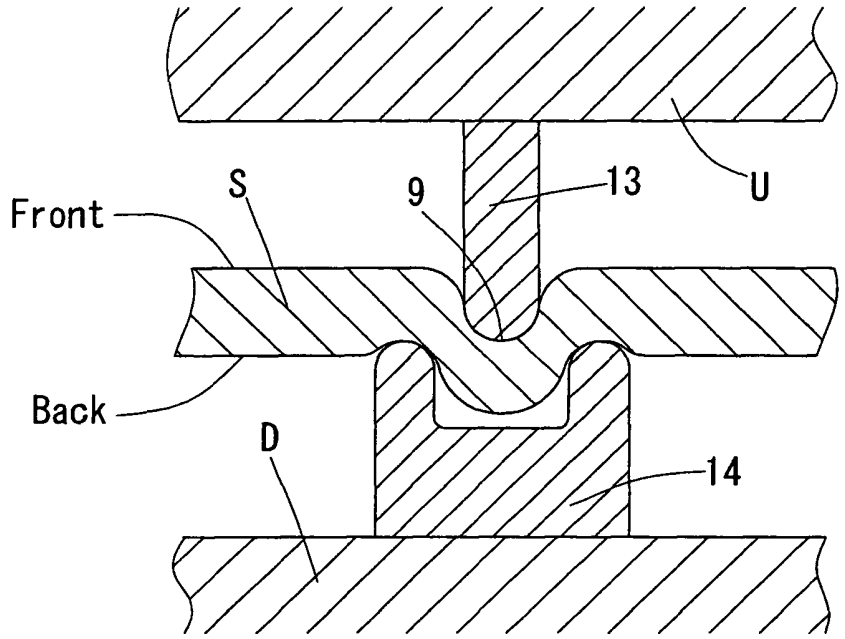


Fig.5



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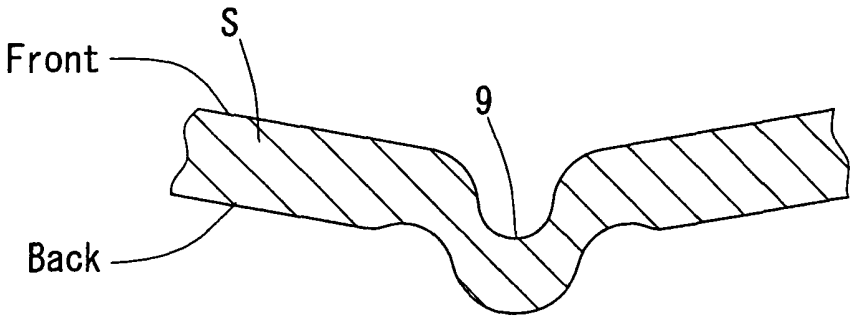


Fig.7

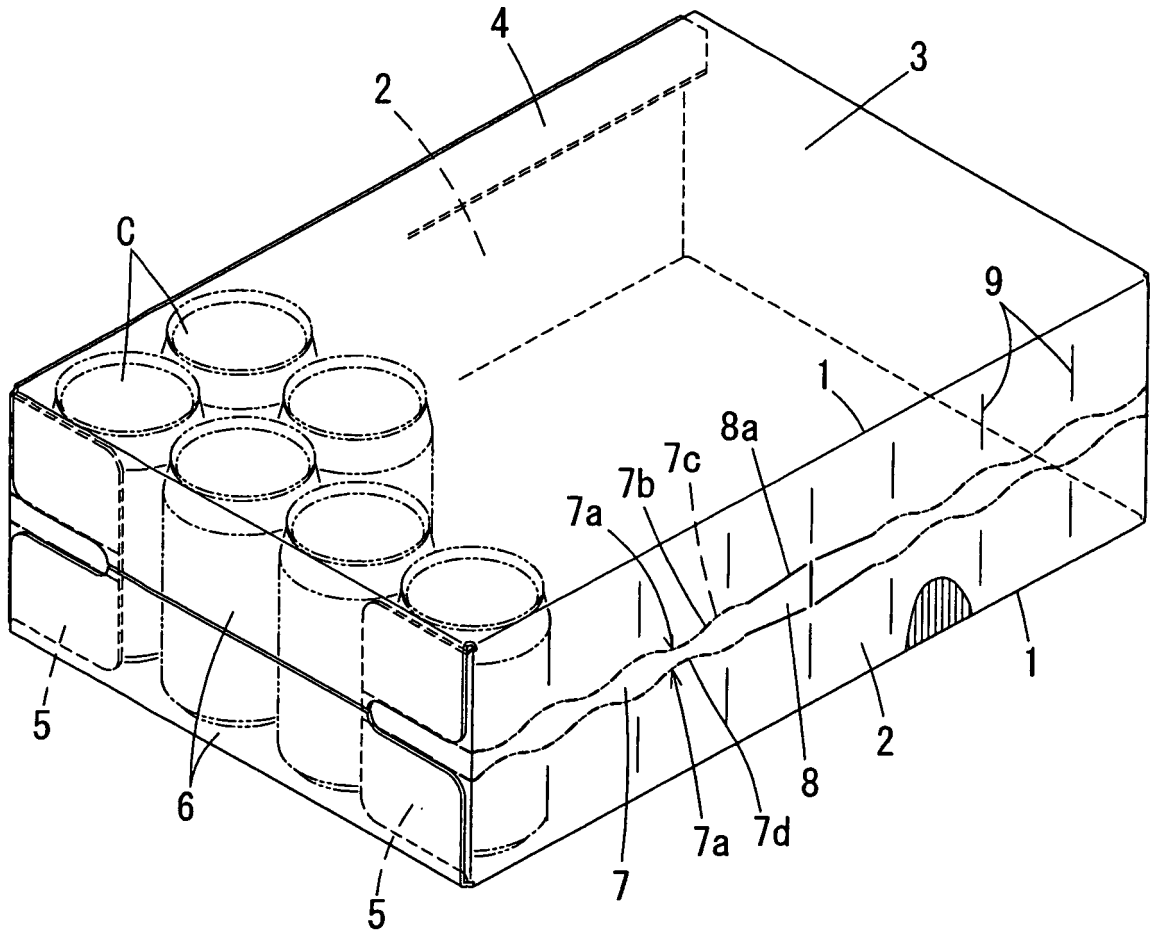


Fig.8

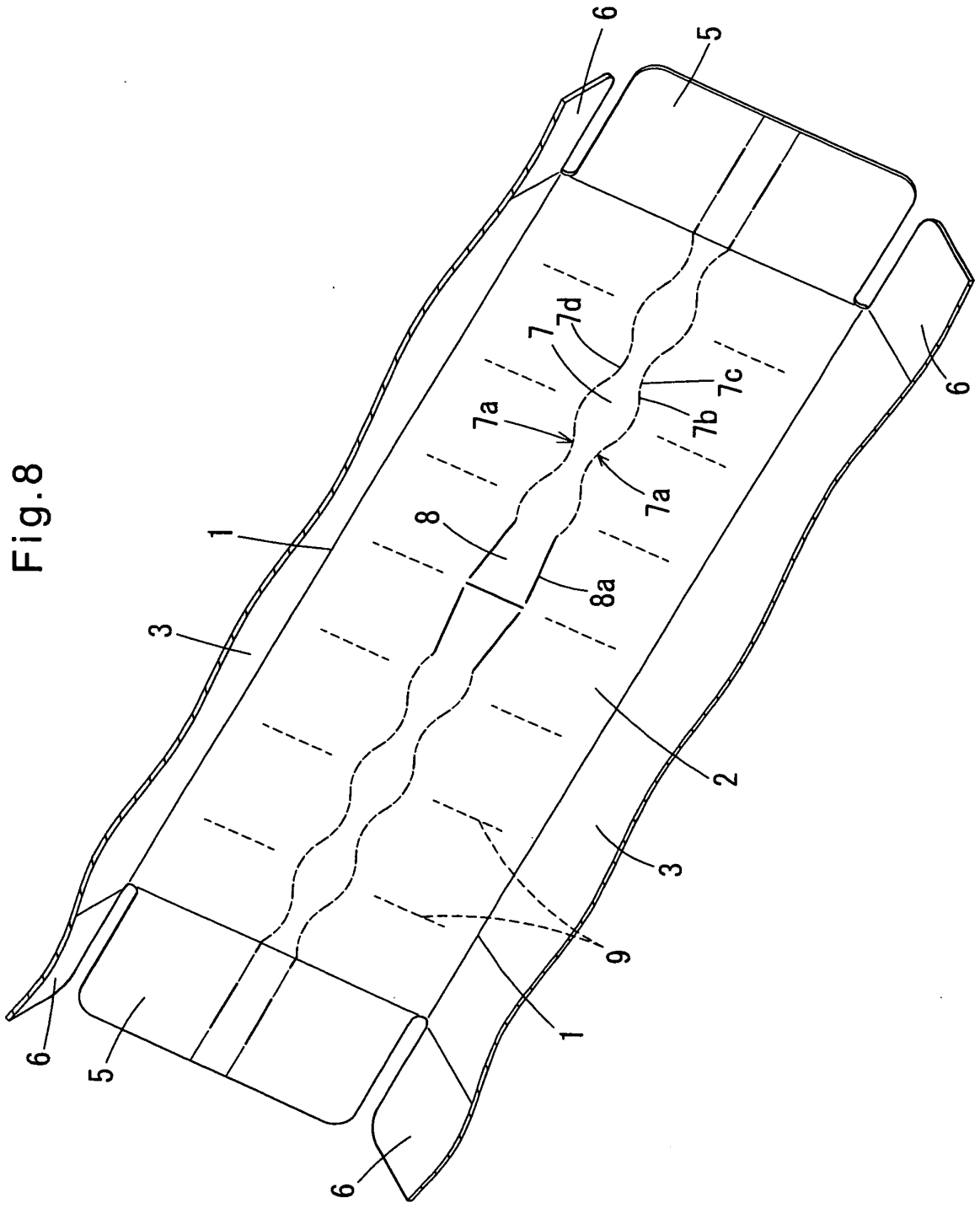


Fig.9

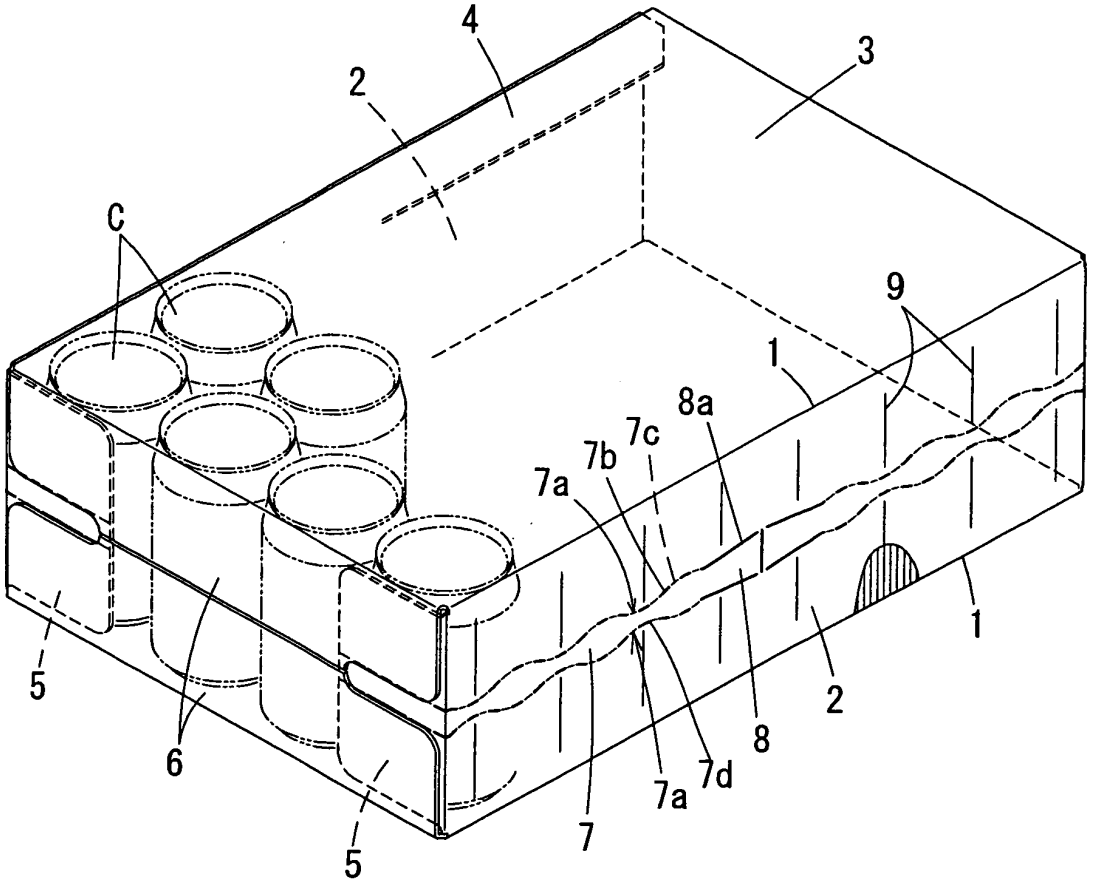


Fig.10

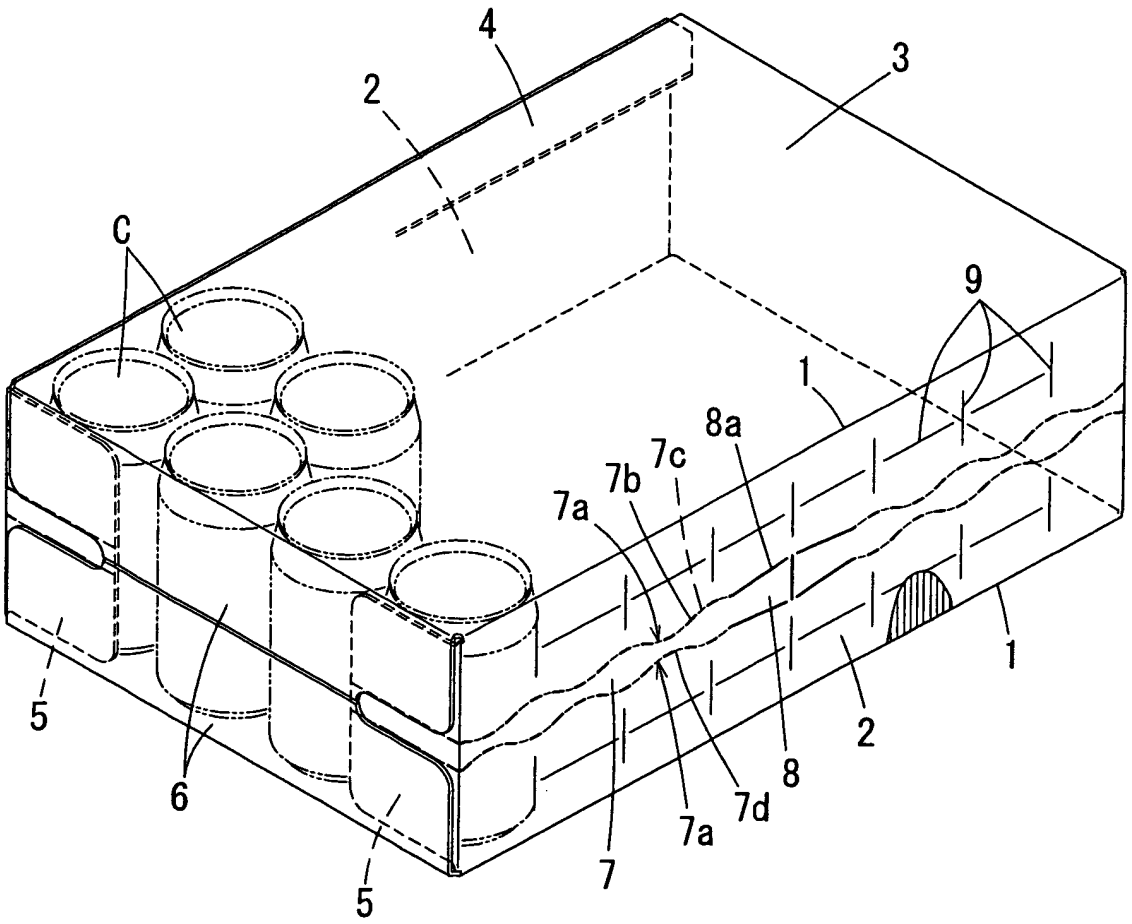
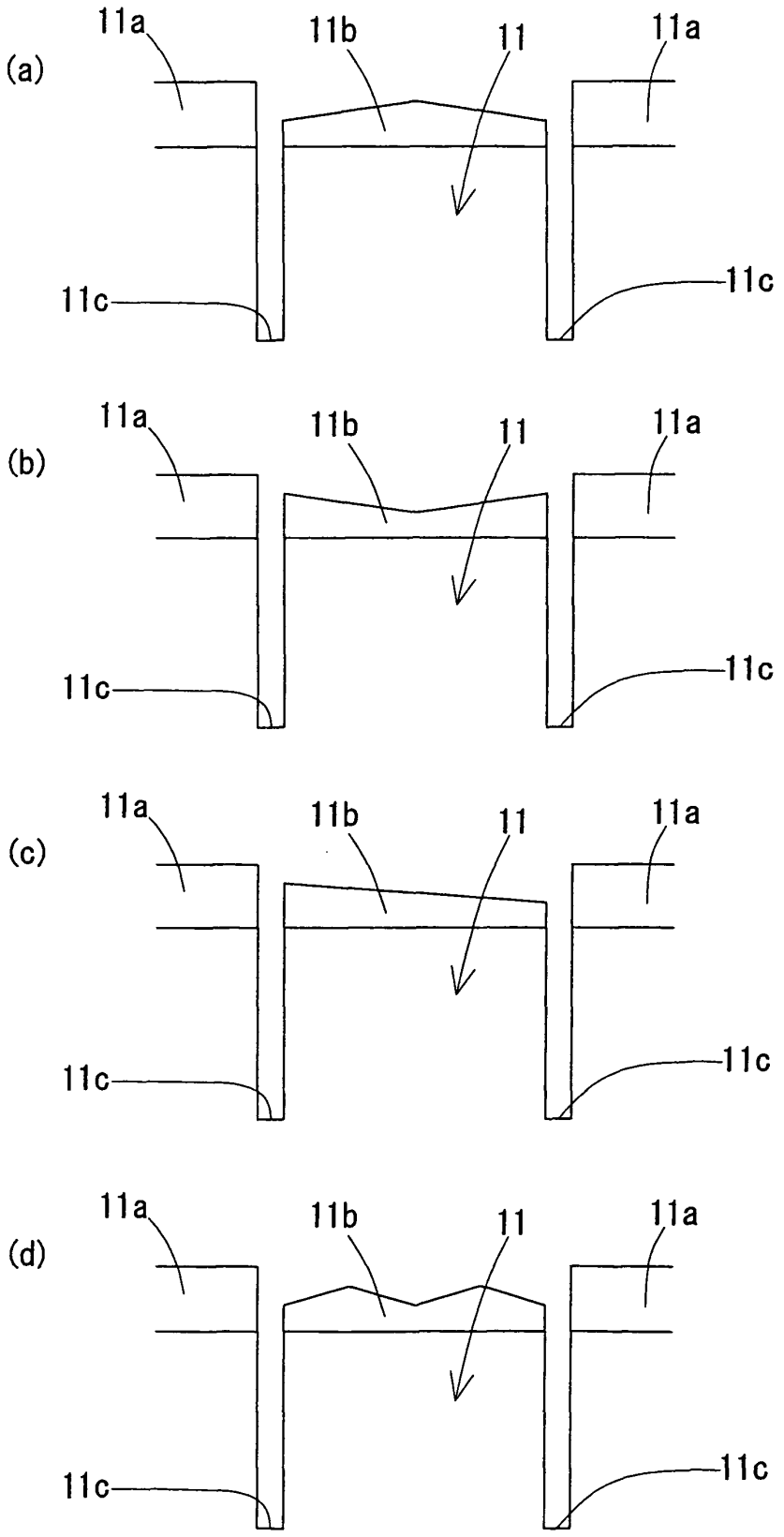


Fig.11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(b)
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Fig.12

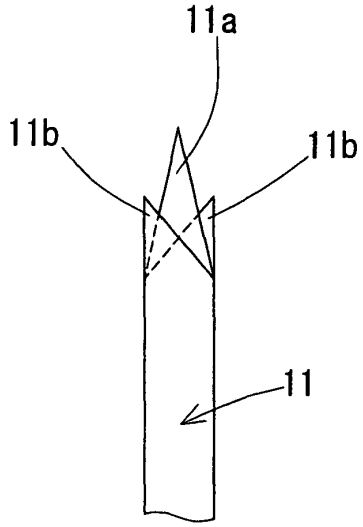


Fig.13

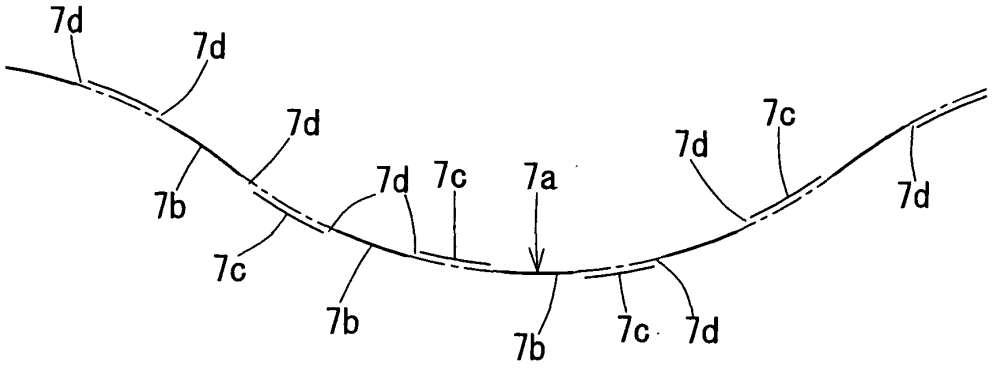


Fig.14

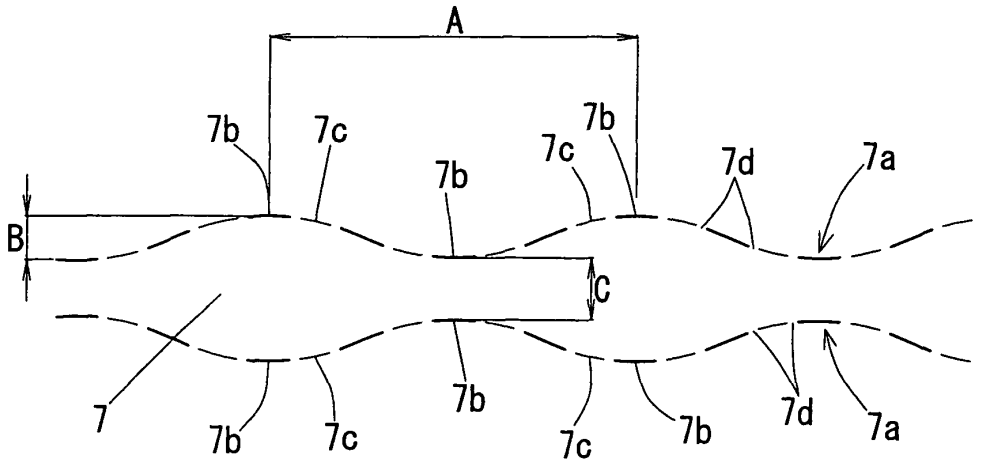


Fig.15

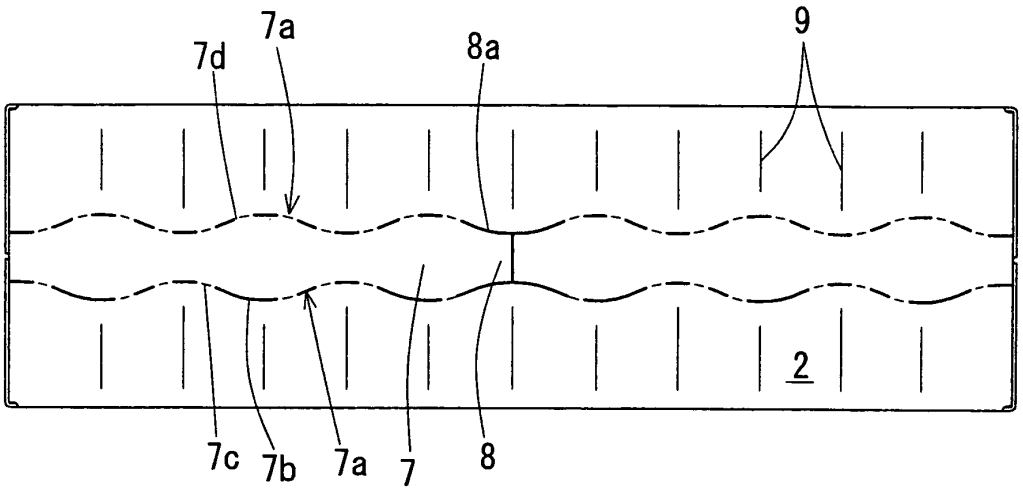


Fig.16

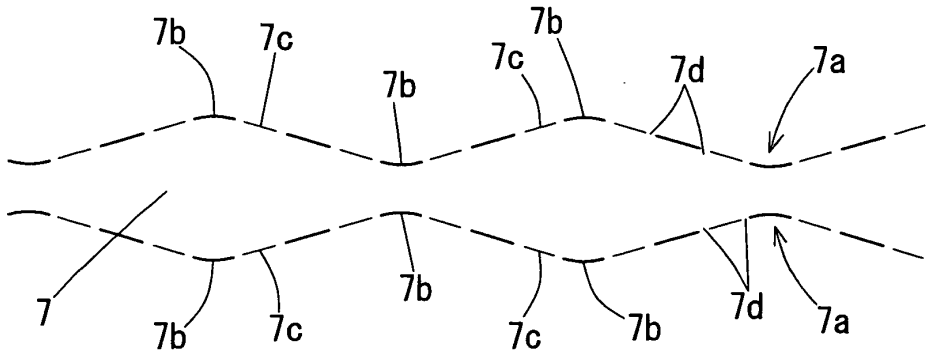


Fig.17

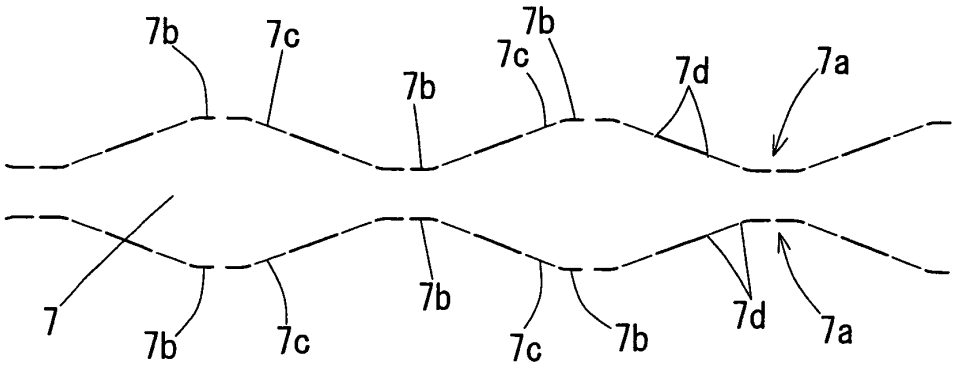


Fig.18

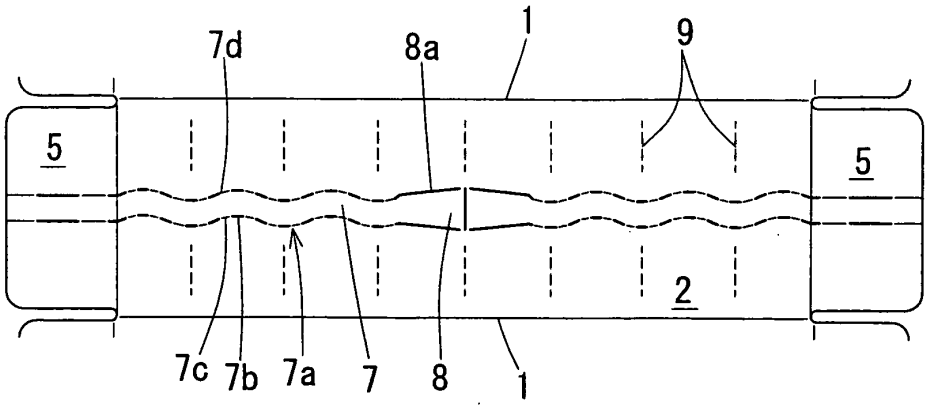


Fig.19

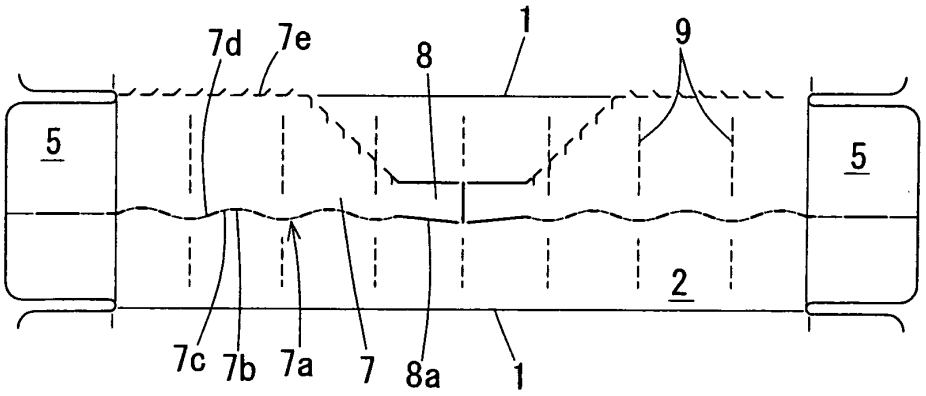


Fig.20

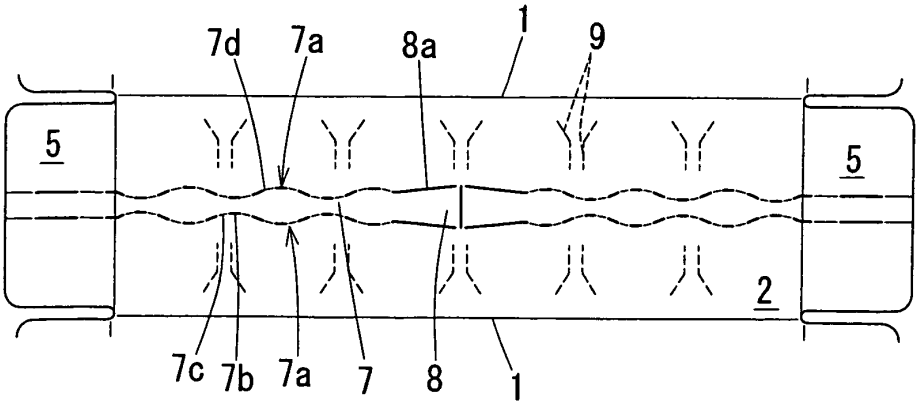


Fig.21

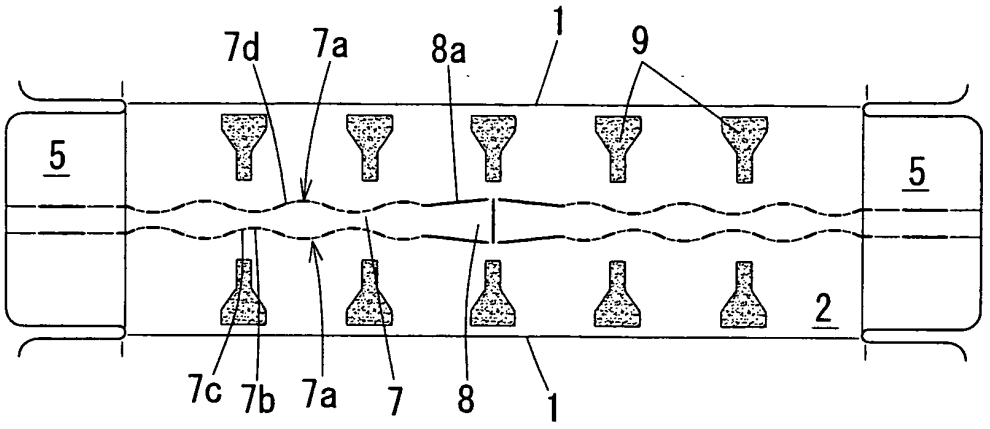


Fig.22

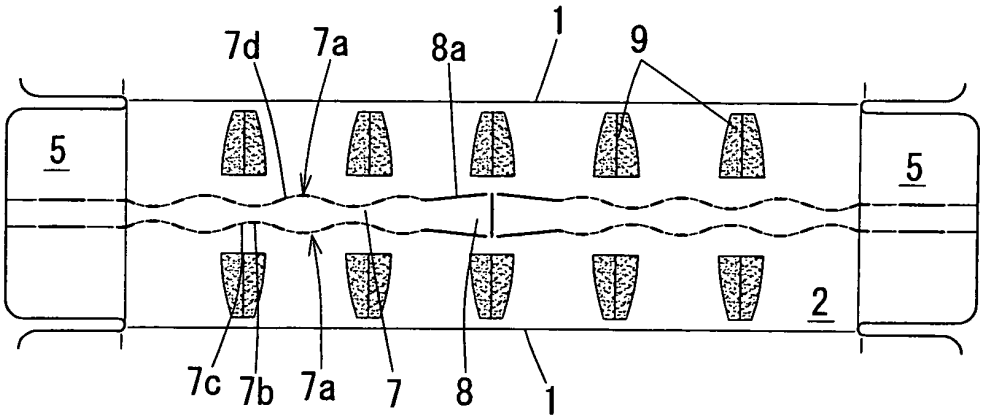


Fig.23

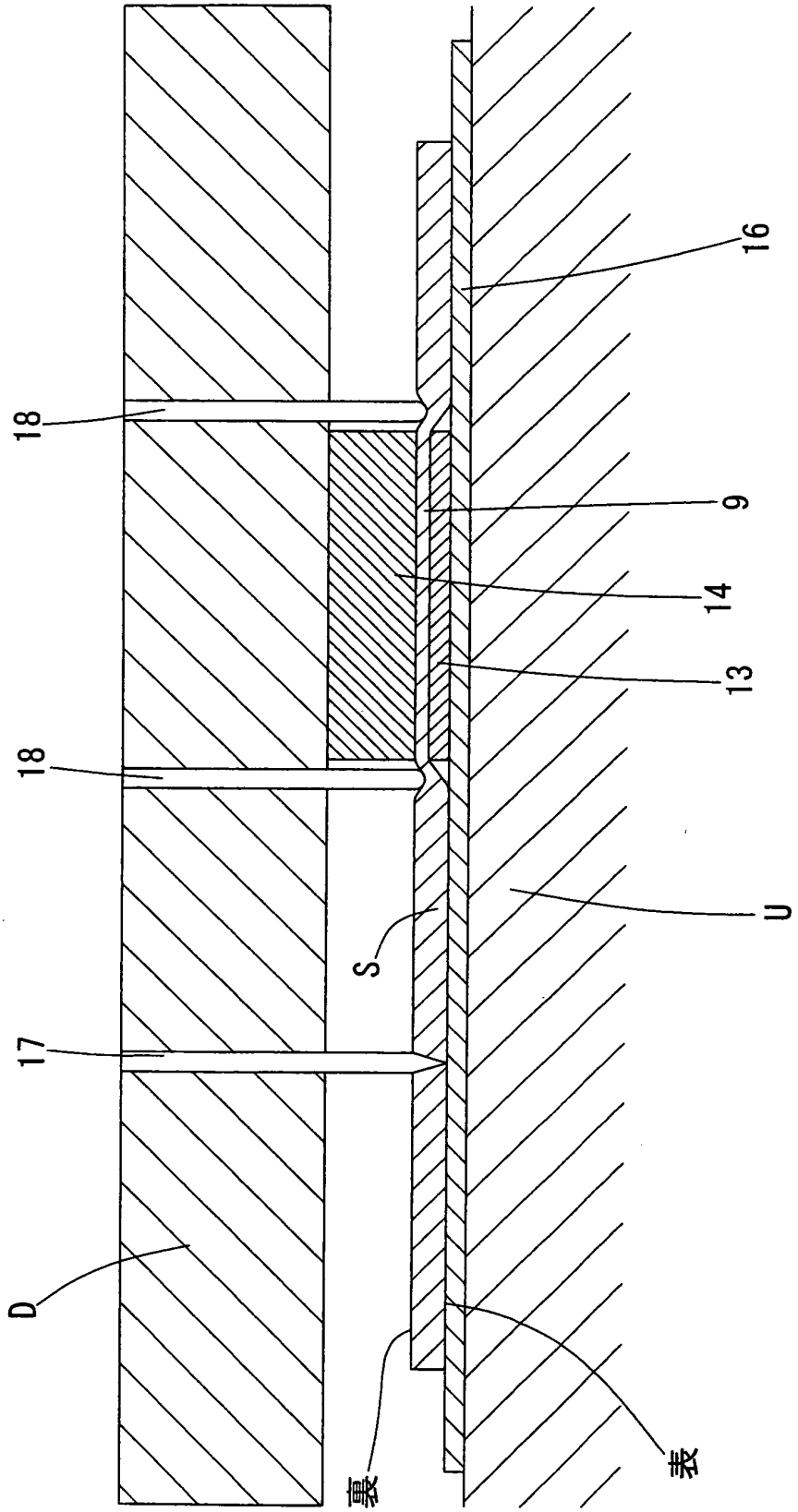
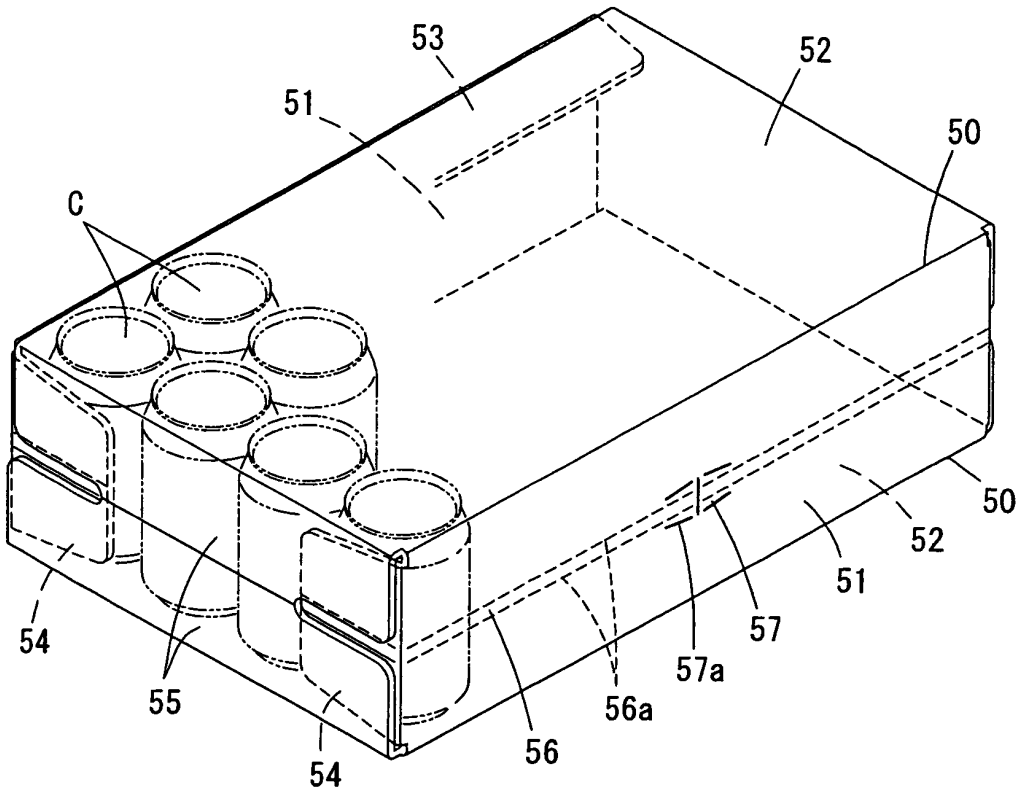


Fig.24



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/065592

A. CLASSIFICATION OF SUBJECT MATTER
B65D5/54(2006.01)i, *B31B1/22*(2006.01)i, *B31B1/90*(2006.01)n

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)
B65D5/54, B31B1/22, B31B1/90

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2007
Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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 2003-246320 A (Rengo Co., Ltd.), 02 September, 2003 (02.09.03), Par. Nos. [0022], [0039]; Figs. 5, 10 (Family: none)	1-3
A	JP 2005-118900 A (Tsukatani Hamono Mfg. Co., Ltd.), 12 May, 2005 (12.05.05), Par. Nos. [0010], [0030], [0068]; Figs. 1, 16 (Family: none)	1-3

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 November, 2007 (02.11.07)	13 November, 2007 (13.11.07)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)