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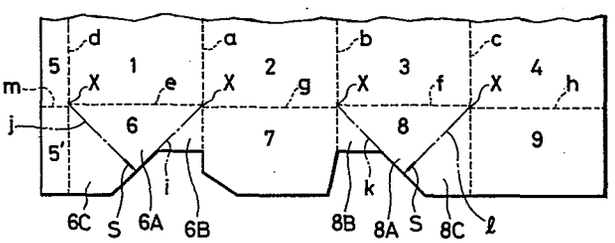
(71) Applicant: **SANYO KOKUSAKU PULP CO. LTD.,**
4-5 Marunouchi 1-chome, Chiyoda-ku Tokyo 100 (JP)

(72) Inventor: **Shirakawa, Kiyoshi, No. 10-12,**
Komagome 4-chome Toshima-ku, Tokyo (JP)

(74) Representative: **Otto, Dieter, Dr.-Ing. et al,**
Patentanwälte Müller-Boré, Deufel, Schön, Hertel
Lewald, Otto Isartorplatz 6 Postfach 26 02 47,
D-8000 München 26 (DE)

(54) **Bottom structure of paper box for liquid.**

(57) A bottom structure for a paper box for liquids is disclosed, which is made of a heat-sealable paper sheet blank having four side portions (1 to 4) and four bottom portions (6 to 9). A pair of opposed ones (7, 9) of the bottom portions constitute an outermost layer of the bottom structure when the paper box is formed. The other pair of opposed bottom portions (6, 8) respectively have right isosceles triangular portions (6A, 8A) and fold-back portions (6B, 6C, 8B, 8C). The fold-back portions (6B, 6C, 8B, 8C) are adapted such that the entire length of their edges parallel to fold lines (e, f) between the corresponding side portions (1, 3) and bottom portions (6, 8) abut with the mating ones uniformly when they are folded back along their fold-back lines (i to l).



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Specification

Title of the Invention

Bottom Structure of Paper Box for Liquid

Background of the Invention

Field of the Invention

This invention relates to a bottom structure of a paper box for containing milk, juice, sake, shoyu and other liquid to be sold.

Prior Art

Recently, paper boxes made of paper sheets capable of being thermally fused and impermeable to liquids, e.g., thick thermoplastic synthetic resin laminated paper sheets and thick synthetic resin sheets have been extensively used to replace the conventional metal cans and bottles for containing milk, juice, sake, shoyu and other liquids to be sold. The paper boxes have many advantages over the metal cans and bottles. Since paper boxes usually have cubic or quadratic prism shape , they can be stacked in a minimum space for transportation or storage. They are light in weight, and their thickness is very small compared to glass containers'. Artistic printing may be readily made on the surface to increase commercial value. They can be readily crushed flat after the content has been taken out and disposed with by incineration after use. They can reliably hold firm the content therein.

These paper boxes are made of thick thermally-fusible thermoplastic resin laminated paper sheets or synthetic resin sheets which are impermeable to liquid at least on the surface in contact with the contained liquid. There has been

a trend for increasing capacities of paper boxes for containing milk or the like; in the past the capacity was typically 180 or 200 mℓ, but up to date there has been demands for 1-ℓ or 1.8-ℓ paper boxes. Therefore, the thickness and weight of paper materials of paper boxes are increased, in order to satisfy the following requirements.

(1) Folded portions must be reduced wherever possible and folded layers should be uniformly distributed to provide relevant stability to the paper box as a whole.

(2) Portions of thick paper sheet which are to be bent or folded back must be least liable for distortion so that the correct cube or quadratic prism shape featuring the box could be accurately maintained.

(3) A particulary weak portion where paper sheets are bent or folded back should be made least free from being weakened and broken.

(4) The paper box must be reliably tight so that the contained liquid will not leak.

Recently paper boxes that can meet these requirements have been extensively used for accommodating milk, juice drinks and the like. Japanese Utility Model Publication No. 46-4661 discloses a paper box for liquids developed by Ex-Cell-O Corporation. The disclosed paper box has a bottom structure formed by folding a thick thermoplastic synthetic resin laminated paper sheet as shown in the developed view in Fig. 1. In the Figure, the solid lines represent outer cut lines or notch lines, the dashed lines represent folding lines along which the opposite side portions of

the paper sheet are to be folded inwardly with respect to the paper so that they are at right angles to each other, and the chain-and-dot lines represent fold-back lines, along which one of the opposite side portions of the paper sheet is to be folded in 180° with respect to the paper so that it-contacts with each other.

This bottom structure of the paper box for liquids features that the portion where the paper edges join at the bottom for the liquid can be minimized. Also, it features that among inwardly folded trianglar portions 10 and 11 and folded-back triangular portions 10a, 10b, 11a and 11b, the triangular portions 10 and 11 are made not to form right isosceles in triangle shape but an isosceles triangle with an apex angle smaller than 90° so that the edges Y and Z of the folded-back portions 10a and 10b closely abut the edges Y and Z' of the folded-in portions 11a and 11b respectively.

The inventor has conducted detailed study of this bottom structure of this prior art paper box for liquids to find that with the paper box disclosed in the Utility Model Registration No. 46-4661, in which the inwardly folded portions 10 and 11 have an isosceles triangle with an apex angle smaller than 90°, the apex portions of the inwardly folded portions 10 and 11 gather at a point and push each other when the paper box is formed. This means that the triangular portions 10a, 10b, 11a and 11b cannot be satisfactorily folded back along the fold-back lines defining the opposite sides of the triangular portions 10 and 11 because the two fold-back lines extend from the apex. In addition, if it is intended to make the

bottom flat by folding back the triangular portions 10a, 10b, 11a and 11b the edges Y and Y' of the triangular portions 10a and 10b abut.with the edges Z and Z' of the triangular portions 11a and 11b closely on the central portions of the bottom and produce gaps near the ends of the abutment line. This increases, it has been confirmed, possibility of leakage of the contained liquid.

The inventor have made extensive researches and investigations in order to eliminate the drawbacks discussed above in the prior art paper box for liquids and proposed in Japanese Utility Model Publication No. 55-20580 a bottom structure for a paper box for liquids, in which the innermost layer portions of the bottom have a trapezpidal shape obtained by removing a right angle apex portion of a right isosceles triangle or shape consisting of the afore-mentioned trapezoidal portion and a rectangular fold-back portion replacing the removed right angle apex portion, thereby permitting the outward folding-back of triangular portions against the innermost bottom layer portions to be made satisfactorily and also permitting the ends of the triangular portions folded back against the innermost bottom layer portions to abut with the mating ones uniformly.

In this proposed bottom structure, unlike the paper box bottom structure disclosed in the Japanese Utility Model Registration No. 46-4661, apex portions of the innermost bottom layer portions corresponding to the portions 10 and 11 do not push each other. Also, the structure is free from two fold-back lines extending from a point. Further, when

the bottom is formed by folding the portions corresponding to the portions 10 and 11 in the disclosed paper box bottom structure along the fold lines and also folding back the portions corresponding to the portions 10a, 10b, 11a and 11b along the fold-back lines, all these portions can be made to lie flat normal to the side portions. This is desired from the standpoint of the readiness in forming the bottom structure. Further, unlike paper box bottom structure disclosed in the Japanese Utility Model Registraion, there is no need of inserting the portion corresponding to the bottom portion 11 between the portions corresponding to the portions 11a and 11b. This again is desired from the standpoint of the readiness in forming the bottom structure. As to the demerit, however, there is formed a square or rectangular central bottom portion consisting of only two layers of the blank constituted by the outermost bottom portions overlapping each other. The sealing property of this portion is inferior to the rest of the bottom which consists of four blank layers.

Summary of the Invention

Object of the invention is to provide a bottom structure for a paper box for liquids, which can eliminate the afore-mentioned square or rectangular central portion of the bottom consisting of only two blank layers while providing the merits of the bottom structure of a paper box for liquids disclosed in the Japanese Utility Model Registration No. 55-20580.

To attain the above object, according to the invention, there is provided a bottom structure for a paper box for liquids, which is made of a heat-sealable paper sheet blank

having four side portions defined by intervening first fold lines and four bottom portions terminating in the respective side portions along second fold lines and also defined by intervening extensions of the first fold lines, a pair of opposed bottom portions among the four bottom portions constituting an outermost layer of the bottom structure and having end portions to be overlapped and heat sealed to each other, the other pair of bottom portions among the four bottom portions each having a right isosceles triangular portion defined by the corresponding second fold line and 45-degree fold-back lines extending from the corners of the corresponding side portion and to be folded at right angles to the corresponding side portion and fold-back portions terminating in the right isosceles triangular portion, one of the fold-back portions being right isosceles triangular in shape and having an edge extending from an intermediate point of a corresponding one of the fold-back lines and parallel to the corresponding one of the fold-back lines, the fold-back portions of the other pair bottom portions being adapted such that the entire lengths of the edges thereof parallel to the second foldlines therebetween and the corresponding side portions abut with the mating ones uniformly.

Brief Description of the Drawings

Fig. 1 is an expansion plan illustrating the manner, in which a paper sheet blank is folded to obtain a bottom structure of a prior art paper box;

Fig. 2 is an expansion plan illustrating the manner, in which a paper sheet blank is folded to obtain an embodiment of the bottom structure of a paper box according to the invention;

Fig. 3 is a perspective view showing the paper sheet blank of Fig. 2 folded to a certain extent;

Fig. 4 is a perspective view showing a paper box obtained from the paper sheet blank shown in Fig. 2; and

Fig. 5 is a top view showing the paper box of Fig. 4 with an upper portion thereof removed.

Detailed Description of the Preferred Embodiment

Now, an embodiment of the bottom structure of a paper box for liquids according to the invention will be described in detail.

Referring to the Figures, the paper sheet blank of the paper box has four side portions 1 to 4 defined by intervening fold lines a to c. It also has a side seam flap 5 terminating in the side portion 1 at one end of the blank along a fold line d. It further has bottom portions 6 and 8 terminating in the respective opposed side portions 1 and 3 along fold lines e and f and also bottom portions 7 and 9 terminating in the respective opposed side portions 2 and 4 along fold lines g and h. The bottom portions 6 to 9 are also defined by intervening extensions of the fold lines a to c. The paper sheet further has a seam flap extension 5' terminating in the side seam frap 5 along a fold line m and also terminating in the bottom

portion 6 along an extension of the fold line d. Of the bottom portions 6 to 9, the bottom portions 7 and 9 are opposed bottom portions constituting an outermost bottom layer. Their free end portions are overlapped and heat sealed together when forming the paper box. The other opposed bottom portions 6 and 8 respectively have right isosceles triangular portions 6A and 8A, which are defined by the fold lines e and f and also by fold-back lines i to ℓ extending from the corners x of the side portions 1 and 3 at an angle of 45° to the fold lines e and f and are folded at right angles to the side portions 1 and 3, and fold-back portions 6B and 6C and 8B and 8C, which terminate on the opposite sides of the portions 6A and 8A along the fold-back lines i and j and k and k and ℓ and are to be heat sealed over their entire area to the portions 6A and 8A. Of the portions 6B, 6C, 8A and 8B, the portions 6B and 8B are right isosceles triangular in shape with the free edges thereof extending from an intermediate point on the fold-back lines i and k and parallel to the fold lines e and f. The other portion 6C and 8C are substantially D-shaped with their free edges partly constituted by extensions of the fold-back lines i and k. The fold-back portions 6B, 6C, 8B and 8C are adapted such that the entire lengths of their free edges parallel to the fold lines between the side portions 1 and 3 and bottom portions 6 and 8 abut with the mating ones uniformly when they are folded back along the fold-back lines i to ℓ. With this heat-sealable paper sheet blank, the fold-back lines i and k have a different length from the length of the other fold-back lines j and ℓ. Therefore, it is sometimes difficult to fold back the portions 6C and 8C along the longer

fold-back lines j and ℓ. Accordingly, notches S are formed, if necessary, in the blank adjacent to the free end of the fold-back lines j and ℓ and on the side thereof opposite the extensions of the side portions 1 and 3.

The paper sheet blank described above, shown in the development view of Fig. 2, is a heat-sealable paper sheet blank, e.g., a thermoplastic synthetic resin laminated paper sheet blank or a synthetic resin sheet blank. To form the bottom structure of the paper box using this heat-sealable paper sheet blank, the side portions 1 to 4 are folded inwardly 90° along the fold lines a to c, and also the side seam flap 5 is folded inwardly 90° along the fold line d. The back surface of the side seam flap 5 is heat sealed to the front surface of the corresponding end portion of the side portion 4. By folding the portions 1 to 5 inwardly 50°, the bottom portions 6 to 9 and seam flap extension 5' are also bent inwardly 90° along extensions of the fold lines a to d. The front surface of the seam flap extension 5' is thus heat sealed to the front surface of the corresponding end portion of the side portion 4 simultaneously with the heat sealing of the side seam flap 5 to the side portion 4.

As a result, a square tube is formed. Afterwards the bottom portions 6 to 9 are folded inwardly along the fold lines e to h between them and the corresponding side portions 1 to 4 as shown in Fig. 3. At this time, the right isosceles triangular fold-back portions 6B and 8B and D-shaped fold-back portions 6C and 8C on the opposite sides of the central right isosceles triangular portions 6A and 8A of the bottom portions 6 and 8 are

folded back 180° against the front surface of the portions 6A and 8A along the 45° fold-back lines i to ℓ which extend from the corners X of the side portions 6 and 8. The front surface of the fold-back portions 6B, 6C, 8B and 8C is heat sealed to the front surface of the corresponding right isosceles triangular portions 6A and 8A of the bottom portions 6 and 8, and then the overlapped end portions of the bottom portions 7 and 9 are heat seald together. In the above way, the bottom structure of a paper box for liquids according to the invention as shown in Figs. 4 and 5 is completed.

With the paper box bottom structure having the above construction according to the invention, the central portions 6A and 8A of the bottom portions 6 and 8 which constitute the innermost paper sheet blank layer of the bottom are right isosceles triangular in shape, and the fold-back portions 6B, 6C, 8B and 8C terminating in these right isosceles triangular central portions 6A and 8A along the respective fold-back lines i to ℓ just overlaps the front surface of the portions 6A and 8A. Nevertheless, only a single fold-back line, namely fold-back lines j and ℓ, extends from the apex of each of the right isosceles triangular portions 6A and 8A. Further, the entire lengths of the free ends of the fold-back portions 6B, 6C, 8B and 8C parallel to the fold lines between the side portions 1 and 3 and bottom portions 6 and 8 uniformly abut with the mating ones, so that the reliability in preventing leakage of the contained liquid can be improved. This improvement in reliability is obtainable because the square or rectangular central bottom

portion consisting of only two paper sheet blanks as in the paper box bottom structure proposed earlier by the inventor and disclosed in the Japanese Utility Model Registration No. 55-20580 is reduced to one half. The remaining half consists of four paper sheet blank layers like the rest of the bottom structure, and the apexes of the right isosceles triangular portions 6A and 8A just touch each other in the remaining four-layer portion. This effect is obtainable because, unlike the paper box bottom structure disclosed in the Japanese Utility Model Registration No. 46-4661, the fold-back lines are at angle not greater than 45° but at just 45° with respect to the fold lines between the bottm portions and side portions so that the right isosceles triangular portions 6A and 8A do not strongly push each other at their apexes.

Further, the bottom structure of a paper box for liquids according to the invention can be formed from the same amount of paper sheet blank as the paper box bottom structure disclosed in the Japanese Utility Model Registration No. 55-20580 and is thus highly economical. Thus, it greatly improves low leakage prevention effect due to the presence of the central bottom portion consisting of only two paper sheet blank layers while having all the features of the paper box bottom structure disclosed in the Japanese Utility Model Registration No. 55-20580. The industrial value which the invention enjoys will be by far greater when paper boxes of larger size are required.

What is Claimed is:

1. A Bottom structure for paper box for liquids made of a heat-sealable paper sheet blank having four side portions defined by intervening first fold lines and four bottom portions terminating in said respective said portions along second fold lines and also defined by intervening extensions of said first fold lines, a pair of opposed bottom portions among said four bottom portions constituting an outermost layer of said bottom structure and having end portions to be overlapped and heat sealed to each other, the other pair of bottom portions among said four bottom portions each having a right isosceles triangular portion defined by said corresponding second fold line and 45-degree fold-back lines extending from the corners of said corresponding side portion and to be folded at right angle to said corresponding side portion and fold-back portions terminating in said right isosceles triangular portion along said respective fold-back lines and to be heat-sealed over the entire area to said right isosceles triangualr portion, one of said fold-back portions being right isosceles triangular in shape and having a free edge extending from an intermediate point of a corresponding one of said fold-back lines and parallel to said corresponding second fold line, the other one of said fold-back portions being substantially D-shaped and having a free edge partly constituting an extension of a corresponding one of said fold-back lines, the fold-back portions of said other pair bottom portions being adapted such that the

entire lengths of the free edges thereof parallel to the second fold lines therebetween and the corresponding side portions abut with the mating ones uniformly.

2. The bottom structure for a paper box for liquids according to claim 1, wherein said heat-sealable paper sheet blank is made from a thermoplastic synthetic resin laminated paper sheet.

3. The bottom structure for a paper box for liquids according to claim 1, wherein said heat-sealable paper sheet blank is made from a synthetic resin sheet.

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FIG. 1

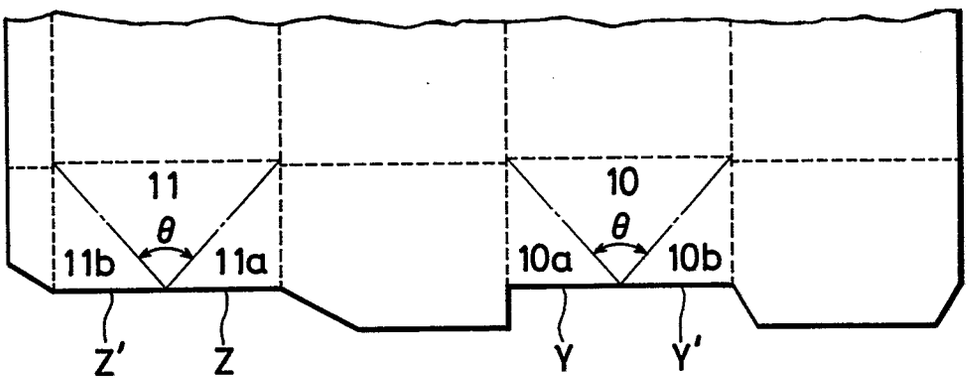

FIG. 2

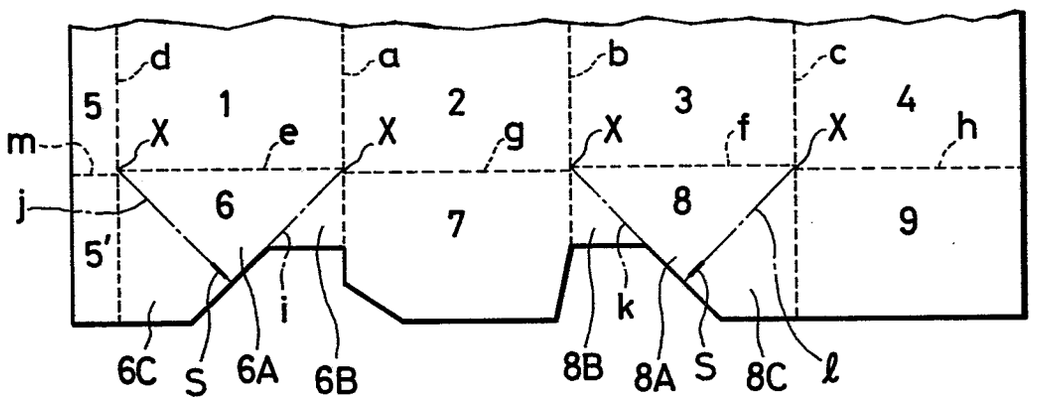

FIG. 3

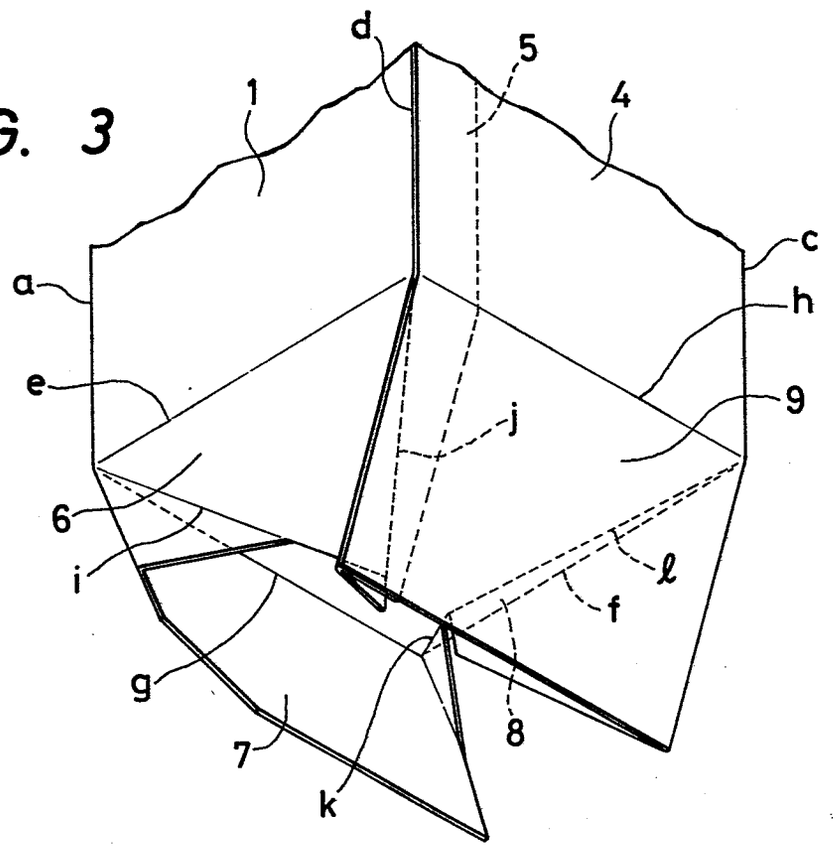

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FIG. 4

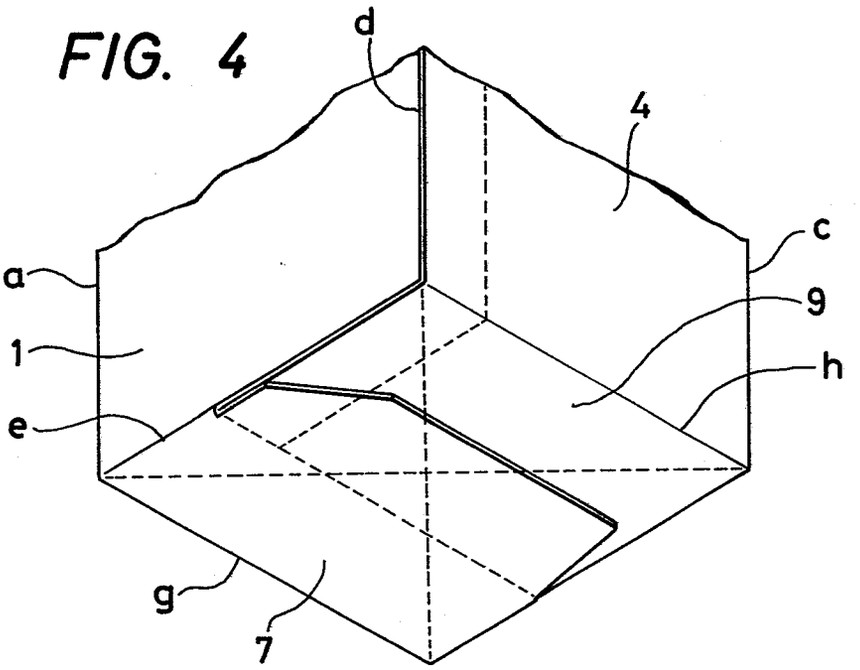
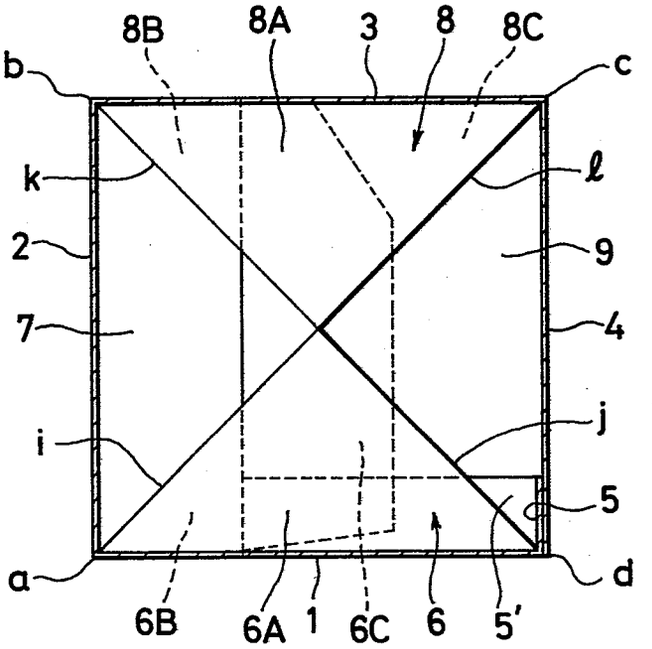


FIG. 5



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EUROPEAN SEARCH REPORT

Application number 0119303

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 83111670.2

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	US - A - 4 113 168 (SHIRAKAWA) * Totality, especially fig. 2, 3,4; column 4, lines 52-54; column 6, lines 43-44 *	1,2,3	B 65 D 5/40 B 65 D 5/08
A	GB - A - 435 891 (QUAEGHEBEUR) * Fig. 1 *	1	
A	US - A - 3 239 126 (ARSLANIAN) * Fig. 1 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

B 65 D 5/00
B 65 D 85/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	26-06-1984	CZUBA

CATEGORY OF CITED DOCUMENTS

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