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(54) Foldable box.

(57) A foldable box with a bottom (1), upright side walls (6) and upright end walls (3), connected to each other at their top ends, one pair of opposed walls (2, 3) and connected wall sections overlapping the two other upright walls (6, 7) are provided with striplike extensions (14, 22; 15, 23; 16, 24; 17, 25) foldable about folding lines (12, 30, 31; 13, 32, 33) and wherein vertical folding lines (26, 38, 39; 27, 40, 41; 28, 42, 43; 29, 44, 45) are provided such, that in each corner of the box a re-entrant corner (34'-37') is formed, whereas in the other pair of upright walls from the corner points of the box a folding line (46-49) is provided, extending upwardly at an angle of approximately 45°.

According to the invention the striplike extensions (10, 22, 23; 11, 24, 25) of the one pair of opposed upright walls (2, 3) are secured in overlapping manner on said pair of opposed walls (2, 3) and on the wall sections (14, 15; 16, 17) connected thereto, except at the location of the re-entrant corners (34'-37').

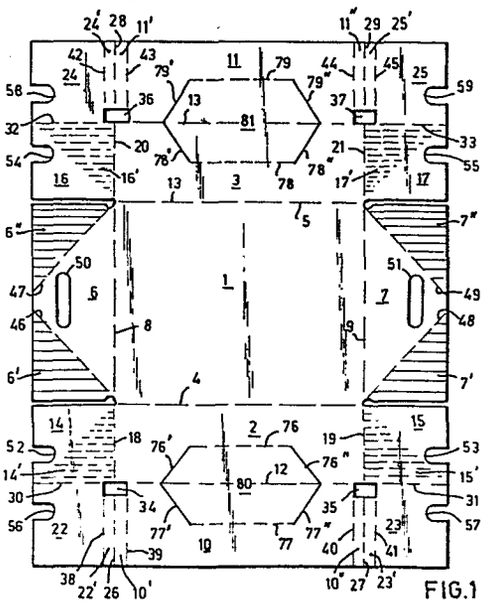

FIG.1

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FOLDABLE BOX

The invention relates to a foldable box with a bottom, upright side walls and upright end walls, which are connected to each other at their top ends with the aid of overlapping upright wall sections, wherein the one pair of opposed walls and their connected wall sections, overlapping the two other upright walls, are provided with striplike extensions foldable about folding lines, said folding lines being spaced apart from each other at the location of the corners of the box by an excision and wherein from the ends and from the center of said excisions vertical folding lines are provided, in such a way that in each of the corners of the box a re-entrant corner is formed with the respective corner wall sections of the box, whereas in the other pair of upright walls from each of the bottom corner points of the box a folding line is provided, extending upwardly at an angle of approximately 45^{o}.

A similar box is known from Dutch patent application 71 17806, laid open to public inspection. In said known foldable box the upright walls with their extensions, are folded, with their extensions lying in one plane, toward the bottom about the folding lines with the bottom, and owing to the connection between the overlapping upright wall sections and the other upright walls the latter upright walls are first folded onto the bottom and

subsequently the first mentioned upright walls with their extensions are folded onto the bottom. When erecting the folded box first the first mentioned upright walls with their extensions have to be folded in a perpendicular position with respect to the bottom and subsequently the extensions have to be refolded onto said upright walls. So folding a used box and unfolding a folded box is cumbersome and time consuming with this known foldable box.

The present invention tends to abolish this disadvantage of the known foldable box.

This object is achieved in that in accordance with the invention the strip-like extensions which are foldable about the folding lines of the one pair of opposed, upright walls, are secured in an overlapping manner on said pair of opposed walls and on the wall sections connected thereto, except at the location of the re-entrant corners.

The effect of this feature is that by simply folding back or folding downwards a pair of upright side walls of the box the latter can be brought from the folded into the unfolded position and reverse in one single action.

In a preferred embodiment, in which in the re-entrant corners a reinforcing member is provided, the invention is that the reinforcing member consists of a compressible support leg.

These support legs serve to carry the weight in the event of stacked, filled boxes. Because the support leg is compressible, the leg can remain in the box when it is being folded, so that said legs need not be delivered individually, and will not get lost.

In a very efficient embodiment of the foldable box in accordance

with the invention the compressible support leg is formed as a hollow bar, which consists of four pivotally interconnected walls.

In accordance with the invention the hollow bar is formed in one piece, wherein the material of the walls at the location of the pivots is thinner than that of the remaining part of the walls.

The invention will be further elucidated with some embodiments, on the basis of the drawing.

Fig. 1 is a plan view of the blank for the foldable box of the invention,

fig. 2 is a perspective view of the unfolded box,

fig. 3 is a plan view of a corner of the box in accordance with fig. 2,

fig. 4 is a cross-section according to the line IV-IV in fig. 2 of the unfolded box at the level of one of the end walls,

fig. 5 is a longitudinal section of the support leg of the box in accordance with line V-V in fig. 6,

fig. 6 is a plan view of the support leg of fig. 5,

fig. 7 is a detail VII of fig. 6 and

fig. 8 is a detail VIII of fig. 6.

The blank of the foldable box of the invention, illustrated in fig. 1, consists of a bottom 1, of two side walls 2 and 3, which are connected to the bottom 1 along folding lines 4, 5

respectively, and of end walls 6 and 7, which are connected to the bottom 1 along folding lines 8 and 9. The side walls 2 and 3 are provided with strip-like extensions 10, 11 resp. which are connected to the side walls 2 and 3 along folding lines 12, 13 respectively. The height of the extensions 10 and 11 is somewhat less than that of the side walls 2 and 3.

At their ends the side walls 2 and 3 are provided with side wall sections 14, 15, 16, 17 respectively, which are connected to the side walls 2 and 3 along folding lines 18, 19, 20 and 21 respectively. The width of the side wall sections 14, 15 and 16, 17 is equal to that of the side walls 2 and 3.

At their ends the strip-like extensions 10 and 11 of the side walls 2, 3 respectively, are provided with lips 22, 23, 24, 25 respectively, which are connected to the extensions 10 and 11 by folding lines 26, 27, 28, 29 respectively, and which are connected to the side wall sections 14, 15, 16, 17 respectively by folding lines 30, 31, 32, 33 respectively. The width of the lips 22, 23 and 24, 25 is equal to that of the extensions 10 and 11. Between the folding line 12 and folding lines 30 and 31 excisions 34, 35 respectively, are provided, and between the folding line 13 and folding lines 32 and 33 excisions 36, 37 respectively, are provided. The excisions 34-37 extend over a certain length and a certain width of the extensions 10 and 11 and the lips 22, 23, 24 and 25. The function of the excisions 34-37 will be further elucidated hereinafter.

The folding lines 26, 27, 28 and 29 are perpendicular to the excisions 34, 35, 36, 37 respectively, and extend from the center of said excisions. From the end edges of the excisions 34, 35, 36 and 37 the folding lines 38 and 39, 40 and 41, 42 and 43, 44 and 45 respectively, are arranged, which are parallel to the folding

lines 26, 27, 28, 29 respectively, and which define corner sections 10' and 22', 10" and 23', 11' and 24', 11" and 25' respectively, with the folding lines 26, 27, 28 and 29.

From the ends of the folding lines 8 and 9 the end walls 6 and 7 of the box are provided with folding lines 46, 47, 48, 49 respectively, extending upwardly at an angle of $\pm 45^{\circ}$, so that in the corners of the end walls 6 and 7 end wall sections 6' and 6", 7' and 7" respectively, are defined. In fig. 1 in the side wall sections 14, 15, 16 and 17 areas 14', 15', 16' and 17' respectively, hatched in dotted lines, are drawn, which are provided at the under side of the blank and which, in the event the box is folded, are located on the upper side of the end wall sections 6', 6", 7' and 7", hatched in drawn lines, as will be further elucidated hereinafter.

The end walls 6 and 7 are provided with a recess 50, 51 respectively, in the configuration of an elongated hole, into which the fingers for carrying the box can be inserted. Furthermore the free end edges of the side wall sections 14, 15, 16 and 17 are provided with a U-shaped recess 52, 53, 54, 55 respectively, whereas the free end edges of the lips 22, 23, 24 and 25 are provided with U-shaped recesses 56, 57, 58 and 59 respectively. In the folded box the U-shaped recesses 52-55 are placed pairwise on the U-shaped recesses 56-59 and said combinations coincide with the ends of the recesses 50 and 51, in the configuration of an elongated hole, in the end walls 6 and 7.

From the blank of fig. 1 the unfolded box of the invention (fig. 2) is formed as follows:

first the extensions 10 and 11 with the lips 22 and 23, 24 and 25 respectively, are provided with an adhesive layer, except for the

corner sections 10' and 22', 10" and 23', 11' and 24', 11" and 25' respectively, subsequently they are folded upwardly about the folding lines 12, 30, 31 and 13, 32, 33 respectively, and they are adhered to the side walls 2, 3 respectively, and the side wall sections 14, 15 and 16, 17 respectively.

Now the end walls 6 and 7 are folded on the bottom 1 about the folding lines 8 and 9 and the hatched end wall sections 6', 6" and 7', 7" are folded back about the folding lines 46, 47, 48 and 49. Then the combinations of side wall sections 14, 15, 16, 17 with the lips 22, 23, 24, 25 are folded inwardly over 180° about the folding lines 18, 19, 20, 21 respectively, and the hatched end wall sections 6', 6" and 7', 7" respectively, are provided with an adhesive layer. Subsequently the combinations of side walls 2, 3 and extensions 10, 11 respectively are folded inwardly over 180° about the folding lines 4 and 5 and finally the hatched areas 14', 15', 16' and 17' are adhered to the end wall sections 6', 6", 7', 7" respectively, which are provided with an adhesive layer.

In order to unfold the folded box from the position of fig. 4, one only needs to fold the side walls 2 and 3 over an angle of 90° squarely to the bottom, and because of the adhering connection between the side walls 2 and 3 and the extensions 10, 11 respectively, and between the side wall sections 14, 15 and 16, 17 and the lips 22, 23 and 24, 25, as well as by the adhering connection between the end wall sections 6', 6" and 7', 7", and the areas 14' and 16', and 15, 17' respectively, the end walls 6 and 7 are also folded upwardly,and are placed squarely to the bottom, so that the situation of fig. 2 is reached again.

Because the excisions 34-37 have a certain width, the re-entrant corners 34', 35', 36' and 37' are shorter than the internal height of the box. In accordance with the invention in each re-entrant

corner 34', 35', 36' and 37' (fig, 2 and 3) a compressible or foldable support leg 60 is placed which is preferably formed as a hollow bar, consisting of four walls 61, 62, 63, 64, which are interconnected by pivots 65, 66, 67 and 68. At the location of the pivots 65, 66, 67 and 68 the material of the walls 61-64 towards the corner points is formed gradually thinner, as appears from fig. 8. The support leg 60 is preferably formed in one piece and is for instance made of flexible synthetic material.

The length of the hollow bar 60 is equal to the internal height of the box, so that the upper top surface 69 is aligned with the upper surface of the box, and two adjacent walls 63 and 64 are provided with an extension 70, 71 respectively, said extensions 70 and 71 being interconnected by means of a relatively thin-walled pivot 72 (fig. 7).

The extensions 70 and 71 are displaced outwardly relative to their pertaining wall 63, 64 respectively, and connected thereto in one piece by means of a square transition parts 73, 74 respectively. Said square transition parts come to lie on the upper edge of the box when inserting the support legs 60. The support legs 60 serve to carry the weight of other similar boxes, placed on top of the box, when the boxes are stacked, wherein the bottom corners of an upper box are received in the corners between the extensions 70 and 71.

Furthermore the support leg 60 preferably has a downwardly tapering cross-section, which facilitates the insertion into the re-entrant corners 34'-37'. Finally, holes 75 to decrease the weight may be provided in one or more walls of the support leg.

When folding the box of the invention, the legs are also folded substantially flat by the folding of the re-entrant corners 34', 35'

36' and 37', which is facilitated by the relatively thin material of the walls and the extensions thereof at the location of the pivots. Therefore the support legs can always remain in the re-entrant corners, so that they cannot get lost. The support legs may possibly be fixedly secured in the re-entrant corners of the box by means of an adhering agent.

In another embodiment the support legs may also be made of cardboard, for instance of the same material as the box is made of.

Furthermore the total length, i.e. the extensions included, of the support legs may be the same as the internal height of the box. Then the extensions are aligned with the respective walls of the hollow bar of the support legs and furthermore in this embodiment the support legs of the boxes are formed with somewhat outwardly inclined end walls and side walls, so that when stacking the boxes the lower portion of an upper box is confined within the upper portion of a lower box, and the boxes in the stack "nest". Then the bottom corners rest on the top faces of the two other walls of the support leg. In such a "tapered" embodiment of the box it is also possible to use support legs of cardboard or synthetic material without extensions at two walls thereof, which support legs would then be shorter than the internal height of the box.

When the support legs 60 are shorter than the internal height of the box, they are preferably formed at such a length that the top face 69 of the support leg 60 is aligned with the top face of the re-entrant corners 34'-37', vide figures 2 and 3. Above said top faces the so-called stack rib x is created, in which in the event of a "tapered" embodiment of the boxes the lower portion of the superimposed box can be received.

In the space of the box, formed by the stack rib x, a cover frame

(not illustrated) having a thickness x can be placed, so that the boxes can be stacked in mutual relation, i.e. they can be stacked such that the corners of the boxes are displaced relative to each other in two adjacent layers in the longitudinal direction of the boxes. The boxes may for instance be stacked in a relation, similar to that according to which the bricks of a wall are placed.

The cover frame gives the box a considerable stability, because it cannot set anymore. Moreover the cover frame may be locked in the open upper ends of the support legs by means of members, fitting therein, and secured onto the cover frame, provided that the cover frame consists of flexible material, for instance cardboard or synthetic material.

Furthermore the support legs, either or not provided with extensions at two walls, may be longer than the internal height of the box, so that vent openings are formed between the boxes of a stack. Said vent openings may be necessary for instance when the boxes are filled with damp articles, for instance fruit and vegetables.

Finally in the side walls 2 and 3 and in the extensions 10 and 11, approximately halfway the width and height respectively, folding lines 76, 77 and 78, 79 respectively, may be provided, which are connected to the folding lines 12, 13 respectively by means of oblique incisions 76' and 76", 77' and 77", 78' and 78", 79' and 79" respectively, vide fig. 1.

In the unfolded position of fig. 2 the thus formed flaps 80 and 81 can be folded inwardly over 180° about the folding lines 76 and 78 and be adhered to the interior of the side walls.

CLAIMS

1. A foldable box with a bottom (1), upright side walls (6) and upright end walls (3), which are connected to each other at their top ends with the aid of overlapping, upright wall section (6', 14'; 6", 16'; 7', 15'; 7", 17') wherein the one pair of opposed walls (2, 3) and their connected wall sections (14, 15; 16, 17), overlapping the two other upright walls (6, 7), are provided with striplike extensions (14, 22; 15, 23;, 16, 24; 17, 25) foldable about folding lines, said folding lines (12, 30, 31; 13, 32, 33) being spaced apart from each other at the location of the corners of the box by an excision (34, 35, 36, 37) and wherein from the ends and from the center of said excisions vertical folding lines (26, 38, 39; 27, 40, 41; 28, 42, 43; 29, 44, 45) are provided, in such a way that in each of the corners of the box a re-entrant corner (34'-37') is formed with the respective corner wall sections of the box, whereas in the other pair of upright walls from each of the bottom corner points of the box a folding lines (46-49) is provided, extending upwardly at an angle of approximately 45^{o}, characterized in that the strip-like extensions (10, 22, 23; 11, 24, 25) foldable about the folding lines (12, 30, 31; 13, 32, 33) of the one pair of opposed, upright walls (2, 3) are secured in an overlapping manner on said pair of opposed walls (2, 3) and on the wall sections (14, 15; 16, 17) connected thereto, expect at the location of the re-entrant corners (34'-37').

2. Foldable box in accordance with claim 1, wherein a reinforcing member is provided in the re-entrant corners (34'-37'), characterized in that the reinforcing member consists of a compressible support leg (60).

3. A foldable box in accordance with claim 2, characterized in that the compressible support leg is formed as a hollow bar (60), which consists of four pivotally interconnected walls (61-64).

4. A foldable box in accordance with claim 2 or 3, characterized in that the hollow bar (60) is formed in one piece, wherein the material of the walls (61-64) at the location of the pivots (65-58) is thinner than that of the remaining part of the walls.

5. A foldable box in accordance with claim 4, characterized in that the hollow bar (60) is formed of synthetic material.

6. A foldable box in accordance with claim 3, 4 or 5, characterized in that the length of the hollow bar (60) is equal to the inner height of the box and that two adjacent walls (63, 64) thereof are provided with an extension (70, 71), said extensions being interconnected by a relatively thin-walled pivot (72), being displaced outwardly relative to their pertaining wall (63, 64), and being integrally connected thereto.

7. A foldable box in accordance with any of claims 3 thru 6, characterized in that the hollow bar (60) has a tapered cross-section.

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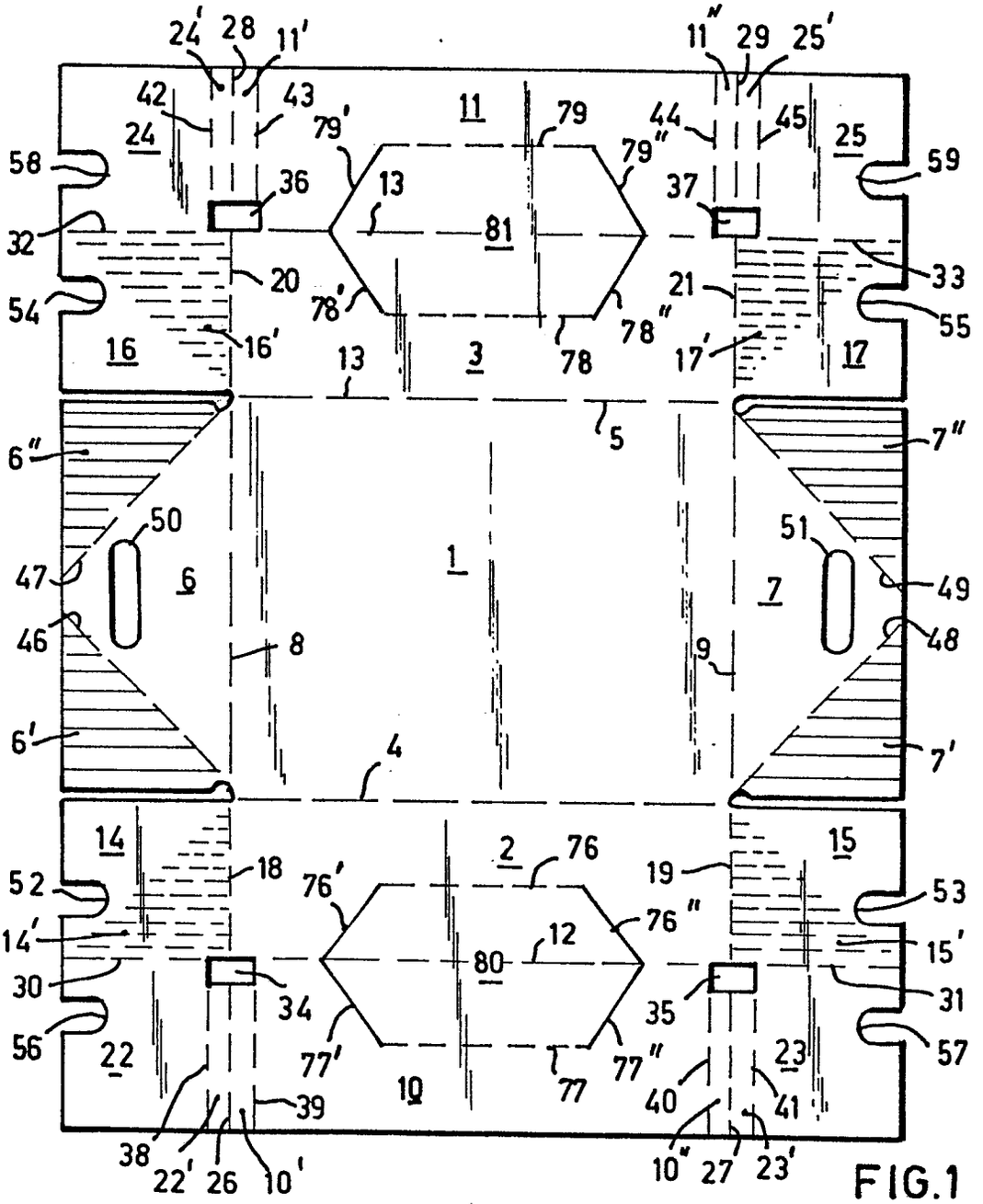

FIG.1

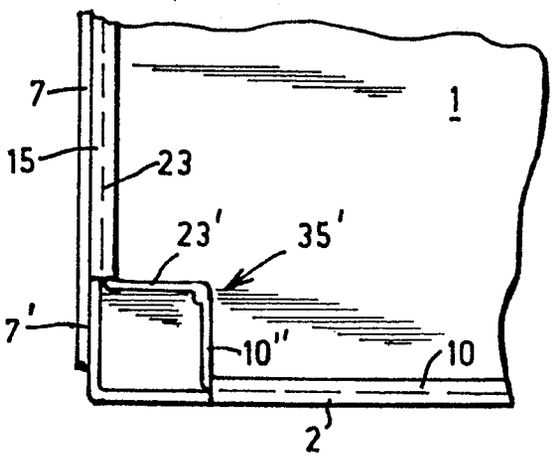

FIG. 3

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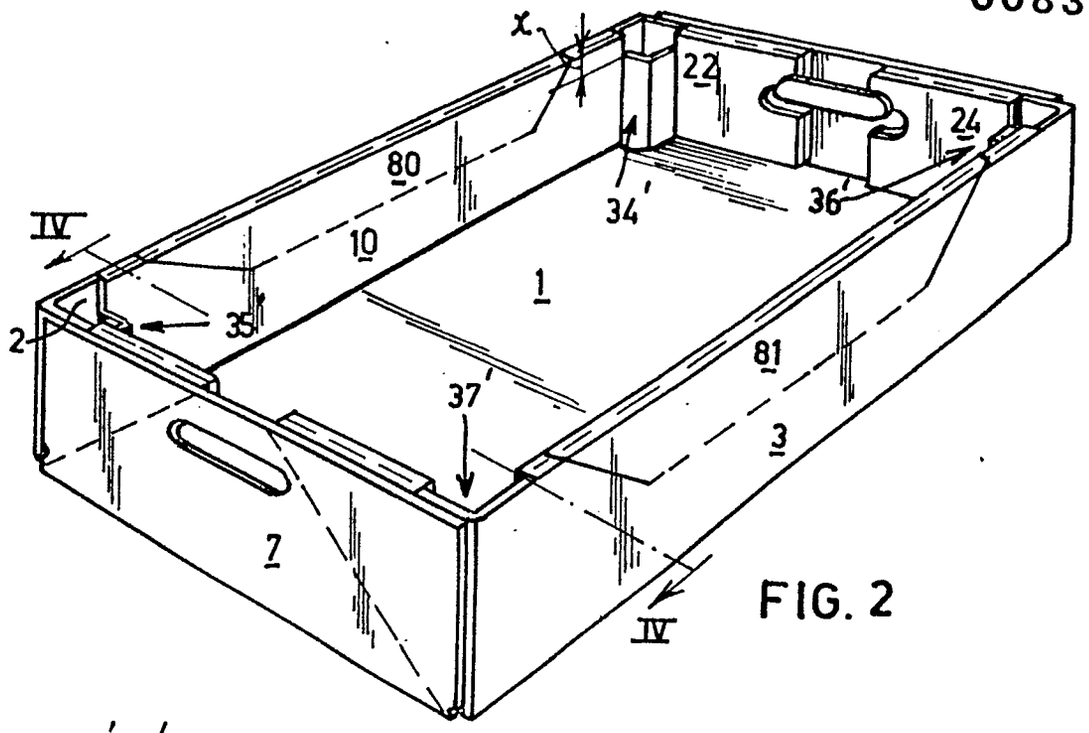

FIG. 2

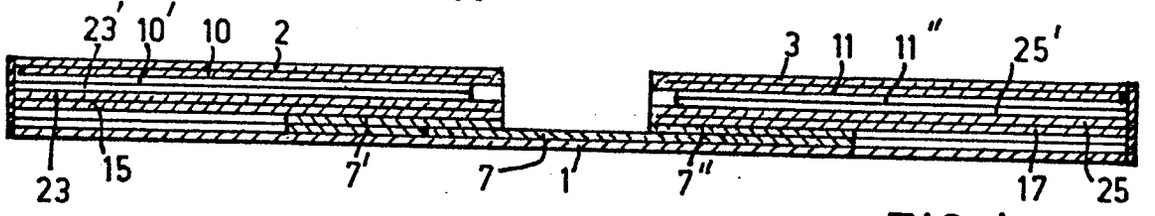

FIG. 4

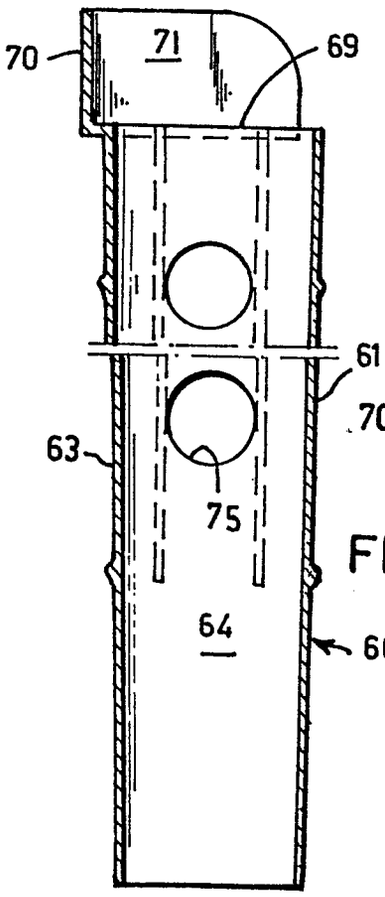

FIG. 5

FIG. 7

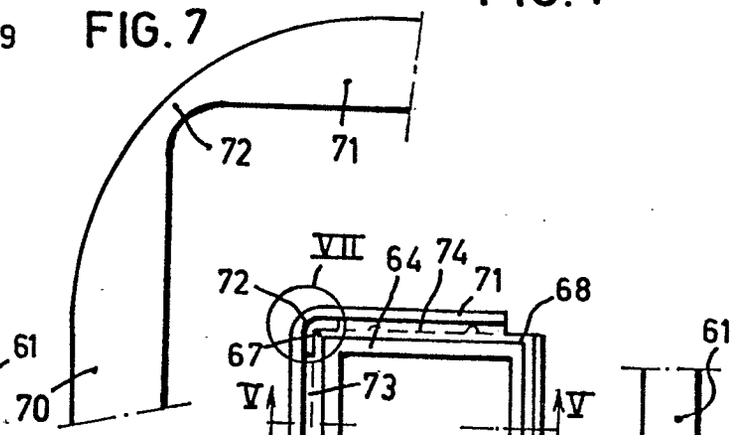

FIG. 6

FIG. 8