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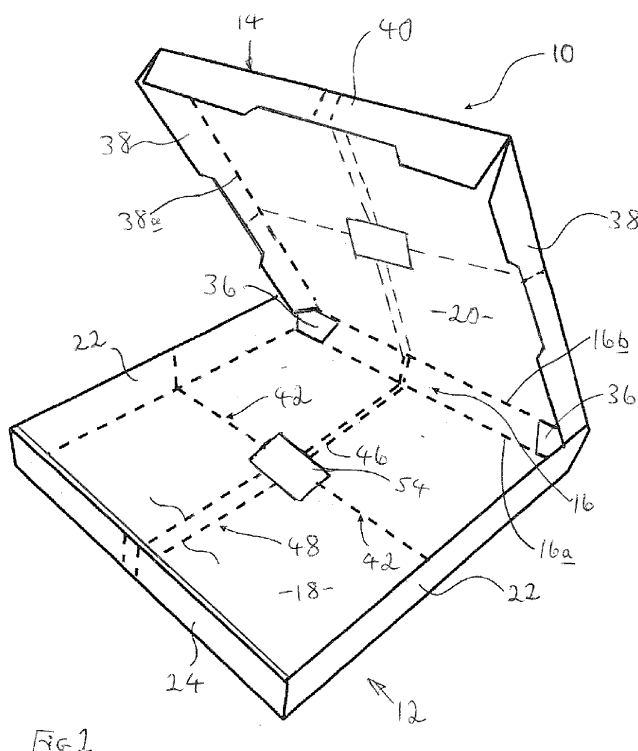
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(54) **Collapsible container**

(57) A collapsible container (10) comprising first (14) and second (12) panels of sheet material, connected to one another at respective edges of the panels by a further panel of the material (16) enabling the first and second panels to lie in spaced parallel relationship to one another, to pivot about fold lines (16a, 16b) towards and away from one another, and to lie in face-to-face contact with

one another, at least one of the panels being provided with first (42, 44) and second (46, 48, 50, 52) surface reliefs extending along respective axes, which axes run between opposed portions of the panel(s) and through a central region of the panel; the axes extending generally perpendicular to one another; characterised in that a central region of the panel (54) is not provided with the reliefs.



## Description

**[0001]** This invention relates to a collapsible container, which may be made out of a sheet material such as corrugated cardboard.

**[0002]** The invention has been devised in relation to a food container, particularly a so-called pizza box, commonly used by fast-food or other establishments for containing ready to eat pizza for consumption off the premises. However, it is to be understood that the invention is applicable to containers intended for purposes other than receiving pizzas. Conventional pizza boxes are made out of a suitable paper-based board material (in order to be bio-degradable). A piece of the material is cut to shape and formed with lines along which the material is readily folded, so that the container, supplied in a flat or non-folded condition, is readily erected by folding along the pre-formed lines to create a box which is generally square in plan view with dimensions suitable to accommodate a respective diameter of pizza, and height sufficient to accommodate the thickness of the pizza. The box has a lid or cover which opens pivotally to give access for placing a pizza in the box and removing the pizza therefrom, either in one piece or cut into a number of smaller pieces.

**[0003]** Pizza boxes are intended for a single use only, after which they are discarded as refuse. One problem with such boxes is that, to accommodate a large pizza, the dimensions in plan view must be slightly greater than the pizza, e.g. 330mm square. The panels of the box which form the cover and base thereof are of such dimensions. Although the box can be collapsed readily from the erected condition, and folded so that the cover and base lie face in face-to-face contact, as long as the cover and base are intact their dimensions are larger than can conveniently be accommodated in many domestic refuse containers.

**[0004]** It has therefore been proposed that a pizza box, in addition to the various prepared folding lines enable it to be erected and collapsed between its flat and box-like configurations, should be provided additionally with further "reliefs" in its panels which are of the largest dimensions, namely its cover and base panels, which reliefs facilitate the folding of the box from a partially-collapsed condition, in which the cover and base panels lie in face to face relationship with one another, to a fully collapsed condition of further-reduced dimensions. In the partially collapsed condition, the largest dimensions of the box are similar to the dimensions in plan of the erected box with the cover closed (in fact slightly larger because of the addition of the further panels or flaps which provide the side, front and rear walls of the box, extending outwardly from the edges of the cover and base panels of the box). The reliefs enable the panels which provide the cover and base of the box to be folded together, firstly to approximately half their size and secondly, by folding in a direction generally perpendicular to that of the first folding, to approximately one quarter of their original size.

**[0005]** Such a box is disclosed in US 6915948B. As

described therein, the reliefs, provided by spaced perforations in surfaces of each of the cover and base panels, comprise a first relief which extends along an axis running between opposed side edges of the panel, near a mid point between front and rear edges of that panel, to facilitate the first folding of the partially collapsed container from that condition to reduce it to approximately half its previous dimension, and a second relief which extends perpendicular to the axis of the first relief. The second relief lies near the mid-point between opposed side edges of the upper and lower panels, and comprises spaced-apart parallel lines to facilitate the folding of the container to reduce it to approximately one quarter of its original size.

**[0006]** Whilst this is effective in facilitating space-efficient disposal of the boxes, it is disadvantageous in that the reliefs in the cover and the base panels reduce the rigidity thereof so that the effectiveness of the box in protecting its contents is reduced. This can be disadvantageous if several erected boxes, with or without contents, are stacked one on another, when the cover and base panels can bow upwardly or downwardly in their central regions.

**[0007]** According to one aspect of the present invention, we provide a collapsible container comprising first and second panels of sheet material, connected to one another at respective edges of the panels by a further panel of the material enabling the first and second panels to lie in spaced parallel relationship to one another, to pivot about the fold lines towards and away from one another, and to lie in face-to-face contact with one another, at least one of the panels being provided with first and second surface reliefs extending along respective axes running between opposed portions of the panel(s) and through a central region of the panel; the axes extending generally perpendicular to one another; wherein a central region of the panel is not provided with the reliefs.

**[0008]** The first and second panels preferably comprise a cover and a base panel of the container, respectively, and the further panel connects fold lines at rear edges of the respective panels to provide a rear wall of the container. Preferably each of the cover and base panels is provided with the first and second reliefs.

**[0009]** The panels are each preferably rectangular or square in shape, having front edges opposite their respective rear edges and side edges opposite one another and extending between the front edge and rear edge of each panel. The front edges and side edges of the panels may be provided with flaps extending from the respective edges along fold lines, to form side walls of the container.

**[0010]** The first relief in each panel may extend along an axis running between opposed side edges of the panel (s), substantially midway between and parallel to the front and rear edges thereof. The second relief may extend along an axis running substantially perpendicular to the axis of the first relief, substantially midway between the opposed side edges of the panel(s).

**[0011]** In a collapsible container, preferably a pizza box, in accordance with the invention, the discontinuance of the reliefs in the central region of the panel is of significant benefit in not reducing the rigidity of the panel, whilst still facilitating its folding to reduce its dimensions when it is to be discarded.

**[0012]** The preferred material for a container in accordance with the invention, such as a pizza box, is corrugated cardboard comprising spaced parallel surface layers of flat cardboard, separated by a spacer or "flute" of corrugated configuration. For example, it may be of the "B" flute type, with an overall thickness of approximately 4mm or the "E" flute type with an overall thickness of approximately 2mm.

**[0013]** The surface reliefs may be afforded by lines of spaced short cuts which extend sufficiently far into the corrugated cardboard to penetrate one of its surface layers but not to penetrate, or to penetrate only minimally, the flute separating the surface layer from the other surface layer of the cardboard. There could, for example, be a succession of cuts of different depth of penetration from one another.

**[0014]** The fold lines may be provided by pressing the cardboard to indent it along the lines where it is to be folded, without cutting into either of the surface layers.

**[0015]** The fold lines and reliefs may be provided by cutting or pressing into the material from one side only thereof, thereby facilitating economical production. A container in accordance with the invention may be collapsed from its erected configuration as described above and disclosed in US 6915948. When it is collapsed to its minimum surface area, its overall thickness is equal to four times the thickness of the corrugated cardboard from which it is made.

**[0016]** Respective parts of the container which are separated from one another by several intervening thicknesses of the corrugated cardboard, in the collapsed container, may be provided with formations engageable with one another to hold them in that relationship, i.e. to prevent the collapsed container from springing back to a configuration which occupies more space. Such formations may comprise a tongue able to be displaced from the board material of one part of the container, engageable with a groove or recess in the other part.

**[0017]** The invention will now be described by way of example with reference to the accompany drawings, of which:

Figure 1 is a perspective view of a container, namely a pizza box, in accordance with the invention.

Figure 2 is a perspective view of a piece of corrugated cardboard from which the box of figure 1 can be erected.

Figure 3 is a section through a piece of the corrugated cardboard material, illustrating the formation of a relief therein.

**[0018]** Referring to figures 1 and 2, a container, namely

a pizza box, in accordance with the invention is indicated generally at 10. It is made by cutting and folding of a single piece of corrugated cardboard of suitable thickness, and figure 1 shows the box comprises a base part indicated generally at 12 and a cover part indicated generally at 14. They are integrally connected to one another by a rear wall part 16, which extends between fold lines 16a, 16b at rear edges of the base part 12 and cover part 14.

**[0019]** Both the base part 12 and cover part 14 are square in plan view, the cover being of marginally smaller dimensions than the base. Each comprises a main panel of the corrugated cardboard material, that for the base part being indicated at 18 and that for the cover part being indicated at 20. The base part 12 has respective side walls 22 upstanding therefrom; these comprise flaps extending along the opposed side edges of the panel 18 at fold lines 22a enabling them to be bent upwardly from the panel 18. The base part further comprises a front wall indicated generally at 24 in figure 1 and whose construction comprises a double thickness of the corrugated cardboard material, comprising a first flap 26 joined to the panel 18 at a fold line 26a at the front edge thereof. Adjacent the fold line 26a, the panel 18 has two spaced slots 28 extending parallel to the fold line 26a.

**[0020]** Joined to the flap 26 at a double fold line 30a there is a further flap 30. The front ends of the side wall flaps 22 have respective end flaps 32 able to be pivoted relative to the side walls at respective continuations of the fold line 26a. Flaps 32 are cut to separate them from the flap 26, while remaining attached to the flaps 22.

**[0021]** To erect the front wall of box from the flat condition shown in figure 2, the side walls firstly are pivoted upwardly about their fold lines 22 so that they are upstanding from the base panel 18. The flaps 32 are pivoted so that they extend parallel to the fold line 26a. The flap 26 is then pivoted upwardly about the fold line 26a until it stands upwardly from the panel 18 and the flaps 32 lie against it. The flap 30 is then pivoted rearwardly about the double fold line 30a to lie in face-to-face relationship with the flap 26 with the flaps 32 therebetween. In this position, tabs 30a on the free edge of the flap 30 are able to be engaged in the slots 28, to hold the front wall 24 in its upstanding position and, by virtue of the engagement of the flaps 22 between the flaps 26, 28, also to hold the side walls 22 in the upstanding position.

**[0022]** At the opposite end of the side walls 22 from the flaps 32, the side walls 22 have flaps 36 which are cut so as to be separate from the rear wall 16 but remain attached to the side walls along continuations of the fold line 16a. When the box is erected, the flaps 36 lie within the box, alongside the rear wall 16, as visible in figure 1.

**[0023]** The cover panel 20 has flaps 38 along its respective side edge, joined at fold lines 38a, and a flap 40 joined at a fold line 40a to what in the erected box is the front edge of the cover panel 20. When the box is closed, the flap 40 fits against the interior surface of the front wall 24, while the flaps 38 fit against the interior surface of

the respective side walls 22.

**[0024]** After use of a box as above described to transport a pizza, for example, the flaps which form the side walls of the cover and base of the box can simply be folded from their erected condition so that the cardboard from which the box is made is returned, approximately, to its flat condition shown in figure 2. The cover 20 can then be folded about the fold line 16a or 16b to overlie the base panel 18. To facilitate the reduction of the surface area thus presented by the partially-dismantled box, each of the base and cover of the box is provided with reliefs as now described. The base 18 and cover 20 each have a first relief extending along an axis as indicated at 42, 44 respectively, these reliefs extending generally parallel to the front and rear edges of the main panels 18, 20 of the base and cover, generally in the mid region of the panel between its front and rear edges. In fact, they are positioned so that when the cover panel 20 is folded to overlie the base panel 18 about the fold line 16a, they are in alignment with one another. A second relief comprising two parts 46, 48 is provided in the base, extending substantially perpendicular to the first relief 42, along an axis lying approximately midway between and parallel to the flaps 22 and fold lines 22a. The parts 46, 48 of the second relief in the base 18 each comprise two spaced parallel relief lines, the spacing between the two lines in the part 48 being greater than that between the two lines in the part 46. The cover 20 also has a second relief comprising two parts 50, 52 extending along an axis in continuation of the axis of the relief parts 46, 48 substantially parallel to the side flaps 38 and fold lines 38a of the cover panel 20. Again, each of the second relief parts 50, 52 of the cover comprises two relief lines, the relief lines 52 being spaced from one another slightly more widely than those of the part 50.

**[0025]** In each of the base 18 and cover 20, there is a central area 54, 56 respectively, in which the reliefs are interrupted, i.e. there is no weakening of the material of the base and cover panels.

**[0026]** The reliefs above described in the base and cover panels enable reduction of the dimensions of the partially-collapsed box, as above described, to approximately one quarter of its previous surface area. With the cover panel 20 overlying the base panel 18, the rear portions of the two panels may be folded about the first reliefs 42, 44 to overlie the front part of the box. Then, one side of the thus-folded box may be folded over the other side, about the relief parts 46, 48, 50, 52. At this stage, the thickness of the folded box amounts to eight times the nominal thickness of the corrugated cardboard material thereof, and it is the formation of the relief parts 50, 52, 46 and 48 as two spaced relief lines, of different spacing therebetween and a maximum spacing between the two lines of the part 48, which facilitates such folding.

**[0027]** For holding the fully-collapsed box in that condition one of the flaps 32 has a generally T-shaped tongue 70 which can be displaced at its wide end from the flap 32, that end being engaged with the V-shaped slot de-

fined between the flap 32 at the opposite side of the box and the adjacent part of the opposite flap 30.

**[0028]** Referring finally now to figure 3 of the drawings, this illustrates a preferred formation for the relief lines above referred to. Figure 3 shows, in cross-section, a piece of corrugated cardboard material of the type of which the box would be made, comprising two surface layers 60, 62 of flat cardboard with a corrugated flute 64 of thinner cardboard therebetween. The relief is provided by a number of spaced cutters indicated at 66, each providing a straight cut portion in line with that provided by the adjacent cutters. The cutters are arranged to penetrate the surface layer 60 of the cardboard, but not to penetrate, or to penetrate only to a small extent, the flute 64.

**[0029]** Such a relief weakens the cardboard along the line thereof to an extent sufficient to facilitate the above described folding reduction of the surface area of the box to facilitate disposal thereof. The central regions 54, 56 in the panels 18, 20 of the base and cover, not being weakened by the reliefs, assist in strengthening the box for use in the situation where several are stacked one upon another.

**[0030]** In the illustrated box, all the reliefs are provided in the visible uppermost surface of the piece of cardboard shown in Figure 2 of the drawings, so it is not necessary to operate on the cardboard from two sides to provide the reliefs therein. For the style of box illustrated, the flute extends in the direction parallel to the reliefs 46, 48 50, 52, so that in the front and rear walls of the box the flute runs vertically to give these walls the maximum rigidity, and strength for the stacking of boxes on another. However the invention is applicable to other styles of box, in which the flute may run in another direction.

**[0031]** When used in this specification and claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

**[0032]** The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

## Claims

1. A collapsible container (10) comprising first (14) and second (12) panels of sheet material, connected to one another at respective edges of the panels by a further panel of the material (16) enabling the first and second panels to lie in spaced parallel relationship to one another, to pivot about fold lines (16a, 16b) towards and away from one another, and to lie

in face-to-face contact with one another, at least one of the panels being provided with first (42, 44) and second (46, 48, 50, 52) surface reliefs extending along respective axes, which axes run between opposed portions of the panel(s) and through a central region of the panel; the axes extending generally perpendicular to one another; **characterised in that** a central region of the panel (54) is not provided with the reliefs.

2. A collapsible container (10) according to claim 1 further **characterised in that** the first and second panels comprise a cover (14) and a base panel (12) of the container, respectively, and the further panel (16) connects fold lines (16a, 16b) at rear edges of the respective panels to provide a rear wall of the container. 5
3. A collapsible container (10) according to claim 2 further **characterised in that** each of the cover (14) and base (12) panels is provided with the first (42, 44) and second (46, 48, 50, 52) reliefs. 10
4. A collapsible container (10) according to any of the preceding claims further **characterised in that** the panels (12, 14) are each rectangular or square in shape, having front edges (26a, 40a) opposite their respective rear edges (16a, 16b) and side edges (22a, 38a) opposite one another and extending between the front edge (20a, 40a) and rear edge (16a, 16b) of each panel. 15
5. A collapsible container (10) according to claim 4 further **characterised in that** at least some of the front edges (20a, 40a) and side edges (22a, 38a) of the panels are provided with flaps (22, 38) extending from the respective edges along fold lines, to form side walls of the container. 20
6. A collapsible container (10) according to claim 4 or claim 5 further **characterised in that** the first relief (42, 44) in each panel extends along an axis running between opposed side edges (22a, 38a) of the panel (s), substantially midway between and parallel to the front and rear edges thereof. 25
7. A collapsible container (10) according to claim 6 further **characterised in that** the second relief (46, 48, 50, 52) extends along an axis running substantially perpendicular to the axis of the first relief, substantially midway between the opposed side edges (22a, 38a) of the panel(s). 30
8. A collapsible container (10) according to any of the preceding claims further **characterised in that** the sheet material is corrugated cardboard. 35
9. A collapsible container (10) according to claim 8 fur- 40

ther **characterised in that** the surface reliefs are afforded by lines of spaced short cuts which extend sufficiently far into the corrugated cardboard to penetrate one of its surface layers but substantially not to penetrate (or to penetrate only minimally), the flute (64) separating the surface layer (60) from the other surface layer (62) of the cardboard.

10. A collapsible container (10) according to any of the preceding claims further **characterised in that** the fold lines and reliefs are provided by cutting or pressing into the material from one side only thereof. 45
11. A collapsible container (10) according to any of the preceding claims further **characterised in that** respective parts of the container separated from one another in the collapsed container have formations engageable with one another to hold them in that relationship. 50

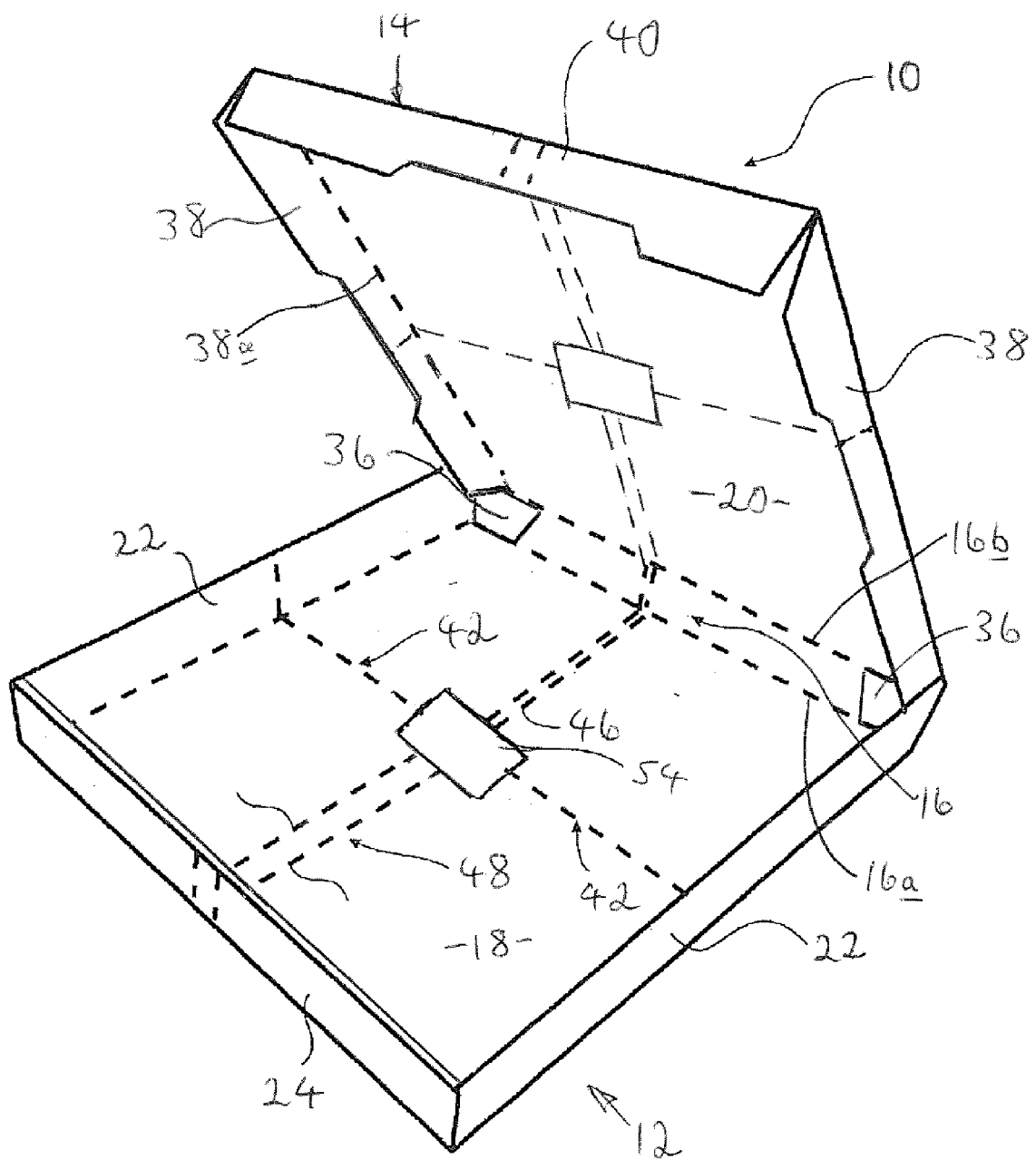
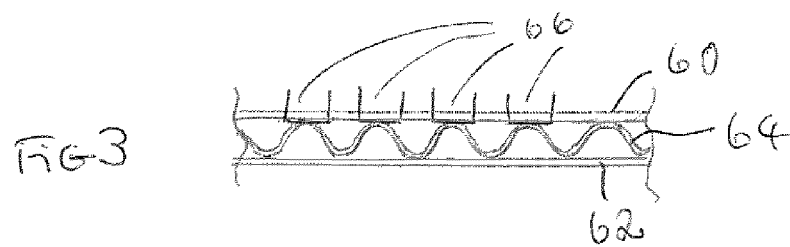
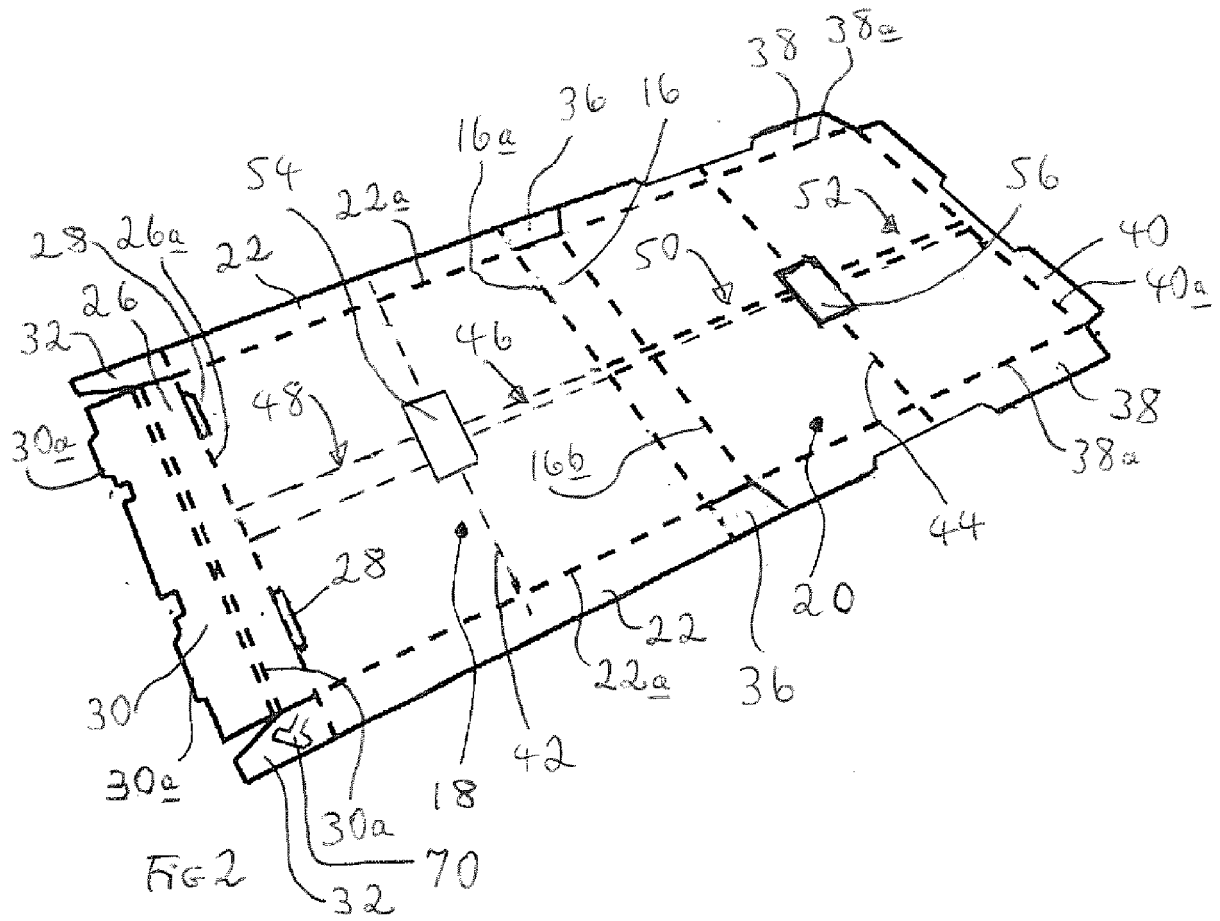


Fig 1





## EUROPEAN SEARCH REPORT

Application Number  
EP 11 18 3627

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2008/055554 A1 (CASTIGLIONI CARLO [IT]; TAVOSO ANDREA [IT]) 15 May 2008 (2008-05-15) * page 5, line 5 - line 13; figures 10-15 *	1-11	INV. B65D85/36 B65D5/54
X	ES 2 263 323 A1 (CAMACHO JUAREZ FRANCISCO [ES]) 1 December 2006 (2006-12-01) * column 4, line 20 - line 22; figures 1-3 *	1-11	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 January 2012	Examiner Derrien, Yannick
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03.82 (P04C01)



**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 18 3627

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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19-01-2012

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**REFERENCES CITED IN THE DESCRIPTION**

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- US 6915948 B [0005] [0015]