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(54) **DUAL-PURPOSE PACKAGING INSERT AND PACKAGING BOX FOR SENSITIVE FLAT OBJECTS**

**DOPPELFUNKTIONSPACKUNGSEINLAGE UND PACKUNGSKARTON FÜR EMPFINDLICHE
FLACHE GEGENSTÄNDE**

**GARNITURE D'EMBALLAGE A DOUBLE USAGE ET BOITE D'EMBALLAGE POUR OBJETS PLATS
FRAGILES**

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Description

[0001] The present invention relates to a packaging box for sensitive flat objects.

Prior Art

[0002] In the packaging industry, buffer materials are generally used to protect packaged items from damage during transport and handling. A popular buffer material is for example polystyrene (in form of EPS panels or inserts) since such material has a very low density, therefore adding little weight to the package, and provides good shock resistance due to its large elastic modulus. Packaging inserts made of such material are often shaped to provide an item to be packaged in a cardboard box with a holding structure which holds it at a distance from the walls of the box to and, by combining the shock absorbing properties of the insert material with room for motion in the box, protects it from damage when the box suffers impact during transport and handling.

[0003] One inherent problem in packaging boxes making use of polystyrene inserts is that the boxes' required structural rigidity can only be achieved by large volume foam inserts that provide a "frame" within the box and thus take up the linear and torsional forces that can act onto the outer cardboard box.

[0004] Polystyrene foam inserts have a further disadvantage in that they present ecological dangers because they cannot be recycled together with other plastics and are, therefore, often disposed of with residual waste which is ultimately destined to be deposited in a landfill or incinerated.

[0005] To avoid these problems and provide the users of the package or box (both manufacturers and consumers) with a more appealing disposal option, the use of paper-based inserts has developed, and particularly the use of so-called honeycomb boards in which honeycomb-like cells of paper are provided on face sheets of cardboard, such as corrugated cardboard, or are sandwiched between two such face sheets. Due to the honeycomb-like structure, the resulting honeycomb board provides outstanding rigidity and torsional stability. In the above and throughout the present application, when the term "honeycomb" or "honeycomb-like" is used, it is to be understood that this shall not limit the structure to an actually honeycomb-shaped cell structure, i.e. is to an essentially hexagonal cell shape, but that equivalent cell structures, such as those made up of wave-like shifted cell walls, are also comprised in the present definition of the term.

[0006] One of the developments of this technology are packaging solutions in which the structural rigidity of an outer cardboard box is achieved by reinforcing the edges and corners of the box with the above mentioned honeycomb paper structures. However, these rigid honeycomb structures cannot provide the desired resilience in order to cushion the packaged item and absorb shocks onto

the item that may occur during handling of the package.

[0007] To overcome this problem, US patents 2,728,479 and 2,761,553 teach to at least partially compress honeycomb panels and, thus, partially or totally crush their honeycomb structure so as to transform the core of the panel into bellows-like cells as cushioning layers, for use as inserts in box-shaped packages. Due to the way of compressing the panels, i.e. in parallel to the cells' honeycomb-like walls, the direction of cushioning is also parallel to these walls, and perpendicular to the face sheet of the panel. In use, the partially crushed layer of the honeycomb material is adjacent to the item to be packaged while the uncrushed portion, via the face sheet, forms the outer wall of the package. However, due to the partial crushing of the cells, the inserts provide only insufficient structural rigidity. An unsatisfactory approach to solve this issue is to increase the overall thickness of the insert, which however renders it less practical and more expensive to produce.

[0008] To protect items such as books, some boxes (see for example GB 2 378 177 A) have an inner space that is simply surrounded by the above-mentioned honeycomb structure to protect the corners and edges of the book against damage, but the protective effect cedes when the weight of the item is substantial like in electrical appliances, or when the impact during handling is large.

[0009] To pack fragile items, in particular, solutions have been proposed in which both uncompressed honeycomb inserts and compressed honeycomb inserts are placed together in a package. In WO 98/42589 A1, which can be considered as most relevant prior art for the present invention, uncompressed honeycomb frames are provided between two cardboard panels to form a flat, book-like box that is well-suited to withstand torsional forces. The fragile object is held in the cavity formed by the surrounding uncompressed honeycomb frames by suspending it between two sheets of elastic film which shall prevent the object from contacting the box walls during transport and handling. The panels may additionally be provided with compressed honeycomb panels that provide cushioning.

[0010] However, due to the nature of the elastic film, this type of packaging is only suitable for comparatively light objects such as statuettes, crockery or the like. Even when the film is strong and tightly tensioned, heavier objects, such as large electronic articles, and in particular substantially flat ones like flat-panel TVs or TV and hi-fi components (DVD players, set-top boxes etc.) will tend to "float" and move around somewhat in the suspending structure when the package is handled, acquiring momentum and possibly touching the walls of the package. If this happens during an accidental impact on the package, serious damage to the object results. In addition, the packaging box of WO 98/42589 A1 does not have any foldable edge portions at the rims of the cardboard panels so it cannot provide any increased torsional stiffness. A further issue is, of course, the environmental impact of such a package, since due to the film it is less

biodegradable or reclaimable than an all-paper package.

[0011] Thus, for larger items, in particular fragile or shock-sensitive objects such as flat LCD TV sets, corrugated boxes with EPS buffers are still widely used. This type of packaging, however, brings about logistical problems because combining corrugated boxes with EPS buffers for flat LCD TV packaging in normal circumstances means that the stacking strength is something to be provided by the corrugated box. Due to thinner and thinner TV sets the industry is struggling with production of boxes with appropriate strength at reasonable prices. Anyway, appropriately strong standing type boxes are too thin and need support in order not to tip over during transport and handling, while horizontal orientation boxes are too difficult to use from a packing and unpacking point of view.

Summary of the invention

[0012] In view of the above, it is an object of the present invention to provide a packaging box made of base and lid portions, the rims of which comprise packaging inserts that provide both torsion resistance and cushioning effects, minimising the number of components necessary to set up a complete packaging box and therefore saving material, time and costs. The aim of such packaging box is to combine structural rigidity and elastic resiliency, in order to securely package and protect sensitive items, in particular flat items sensitive to mechanical shock, while at the same time being easy to assemble and quick to package the object. Such items will, for example, be electronic equipment like flat-panel television sets or computer monitors, but possibly also items such as large paintings. The above objects are achieved by means of a packaging box as claimed in claims 1 or 4. Preferred embodiments of the invention are defined in the respective dependent claims.

[0013] Consequently, in a first aspect the invention provides a packaging box for a flat object sensitive to mechanical shock as defined in claim 1.

[0014] The term "uncompressed" is to be understood as referring to such a honeycomb paper structure in which the cells have not been crushed, whereas the term "compressed" is to be understood as referring to such portions of the honeycomb paper structures in which the cell walls have been at least partially crushed or deformed along at least a portion of the cell walls' height by application of a force substantially parallel to the cell walls, and thus in this area portion no longer provide the rigidity and stiffness of the uncompressed cell walls, but rather resilience and cushioning in a direction substantially perpendicular to the planar sides of the honeycomb paper structure (substantially parallel to the direction of the cell walls in an uncompressed state).

[0015] As mentioned, the core of the insert extends continuously from the uncompressed area portion into the compressed area portion, in other words it is intact across the imaginary boundary between an uncom-

pressed area portion and a compressed area portion and can, therefore, provide additional stability to the insert, avoiding for example possible breakage or separation, which otherwise could occur along the boundary of separate compressed and uncompressed structures.

[0016] The insert of the packaging box of the invention thus is a honeycomb paper structure with compressed and uncompressed area portions next to each other (in the plane of the sides or the face sheet), the thicknesses of which can be precisely defined and which can, therefore, be tailored to the specific requirements of packaging fragile or sensitive items. In particular, the thickness of the compressed area portion is smaller than the thickness of the uncompressed area portion, and may be specifically adapted to the fragile or sensitive item the insert will be used with. The dual-purpose packaging insert provides both the rigidity necessary to reinforce the packaging box, for example along edges and/or corners, and the resilience required for cushioning the fragile or sensitive item, such as for example a flat panel TV, held by the one or more of the inserts within the package. The above insert provides both benefits at the same time, while being available in predetermined shapes and numbers, and obtainable in mass production.

[0017] The dual-purpose packaging insert of the packaging box of the invention can be applied for immediate use in reinforcing and cushioning within packaging boxes. With the insert of the packaging box of the invention, it is no longer necessary to rely on separate cushioning and reinforcing inserts (which are separately and often sequentially processed from a blank of honeycomb material).

[0018] Preferably, the perimeter of the uncompressed area portion and/or the compressed area portion comprises a curved or angled line, wherein the angled line comprises at least one not substantially right angle. In other words, the outer edge of the packaging insert and/or the borderline between uncompressed and compressed area portions may be of these line shapes, and thus perfectly adaptable to the intended use. This is particularly advantageous in packaging of shock-sensitive electronic equipment, since these items mostly require non-straight peripheries of the insert and the compressed and uncompressed area portions.

[0019] Preferably, the dual-purpose packaging insert is L-shaped. This shape allows the insert to be advantageously used in corners of packaging inserts, which are particularly vulnerable to impact during handling of the package and, thus, need particular reinforcement. Here, the L-shape is intended as in the plane of the face or cover sheet as the structure of the insert with adjacent compressed and uncompressed area portions will naturally result in a substantially L-shaped cross-section along a section through both adjacent area portions.

[0020] In an alternative aspect thereto, the invention provides a packaging box for a sensitive flat object as defined in claim 4, comprising a base and a lid portion made of generally flat corrugated cardboard, wherein the

rims of the base and the lid portion are comprised of foldable edge portions of the cardboard and are provided at least at the corners of the rims with reinforcing inserts made of honeycomb paper structures having a core made of a plurality of uncompressed hollow cells defined by undeformed cell walls extending between and defining opposing planar sides which are substantially perpendicular to the cell walls and at least one of which is covered by a face sheet, the reinforcing inserts thus providing structural stiffness and rigidity to the box, and the base and lid portions are provided with cushioning inserts made of honeycomb paper structures having a core made of a plurality of compressed hollow cells defined by at least partially deformed cell walls extending between and defining opposing planar sides which are substantially perpendicular to the cell walls and at least one of which is covered by a face sheet, so as to receive and resiliently hold the flat object when the base and lid portions are closed, and thus to provide cushioning to the flat object in a direction perpendicular to the planar sides, and wherein the foldable edge portions of the rims are folded over and around at least two sides of the uncompressed area portions.

[0021] As stated above, the packaging box of the above two aspects of the invention comprises base and lid portions, with the base and lid portions forming the major sides of the box. The foldable edge portions can be folded up and provide the small-edge or minor sides of the box.

[0022] The packaging box of the invention is thus a box that may be laid or stored on its base portion and simply opened by lifting off the lid portion which will provide a large opening to the inner space of the box.

This allows for particularly convenient access to the packaging box and greatly facilitates loading the sensitive flat object into the box, which has to be simply deposited onto the compressed area portions of the dual-purpose packaging insert or the cushioning insert of the box. The compressed area portions are already present in the box and can be provided in the size, shape and thickness appropriate for the object to be packaged so that it is securely held and cushioned, without possibility for unwanted displacements (other than those due to the resilience of the cushioning). No inserts have to be added or placed in the box, once the object is inside. Then, the lid portion is simply lowered onto the base portion and the box is closed. Securing the box against reopening may be effected by standard techniques such as taping. At the same time, it is also very easy for the user to unpack the sensitive flat object by raising the lid portion to open the box and simply lifting the object out of it. No inserts have to be removed.

[0023] As has been mentioned above for the packaging insert of the invention, and which applies also to the reinforcing insert and the cushioning insert, the thickness of the compressed area portion (cushioning insert) is smaller than the thickness of the uncompressed area portion (reinforcing insert), and may be specifically adapted

to the fragile or sensitive object the insert will be used with. Thus, the inserts can provide a holding structure capable of securely supporting the object from all sides of the box.

[0024] Moreover, while the uncompressed area portions or the reinforcing inserts are provided at least at the corners of the rims (i.e. of the box), the actual extension along the rims away from the corners will depend upon the rigidity and stability requirements placed upon the box. In general, the uncompressed area portions or the reinforcing inserts will extend along a fifth or more of the length along at least one of the two rims leading away from the corner.

[0025] The foldable edge portions will comprise two (or three even parts) that are adjacent to each other when going towards the edge of the base and lid portions, and are each foldable at a right angle to the adjacent part. Thus, the foldable edge portions form a rim having a substantially square U-shaped (or open square tubular shaped) cross-section, which provides a high degree of stability to the rim.

[0026] It is advantageous that the perimeter of the cushioning inserts and/or of the reinforcing inserts comprises a curved or angled line, wherein the angled line comprises at least one not substantially right angle. In other words, the outer edge of the cushioning and/or reinforcing inserts, including any line separating them, may be of these line shapes. This is particularly useful in packaging of shock-sensitive electronic equipment, since these items mostly require non-straight peripheries of the inserts.

[0027] According to both aspects of the invention, the foldable edge portions of the rims are folded over and around at least two sides of the uncompressed area portions or the reinforcing inserts. In other words, the rims of the packaging box of the invention are comprised by a highly stable uncompressed honeycomb structure enveloped by the U-shape folded edge portions of corrugated cardboard, which results in strong, highly stable rims that provide the packaging box with superior torsional stiffness. This is particularly important when packaging sensitive flat objects such as flat panel screens that must not be bent during transport and handling.

[0028] Preferably, the base and lid portions are connected to each other by a hinge portion of the cardboard so as to open or close the box. The packaging box of the invention is thus a clam shell type box which, when laid or stored on its base portion, can simply be opened by lifting the lid portion which will swivel about the hinge portion, to again provide a large opening to the inner space of the box.

[0029] Preferably, the hinge portion is a flat rectangular portion of the cardboard. In this manner, the hinge can effectively form a small-edge or minor side of the box. In such case, it is preferably connected to the base and lid portions through a bend or score line, so as to be foldable at a right angle to the base and lid portions.

[0030] It is particularly preferred that the box further

comprises second reinforcing and/ or cushioning inserts arranged at the hinge portion. In this way, the object to be held can be supported from all sides,

[0031] Advantageously, the uncompressed area portions of the dual-purpose packaging inserts or the reinforcing inserts extend along two opposing sides of the rims adjacent to the hinge portion. These opposing sides correspond to the lateral small-edge/minor sides of the box when viewed in the opening direction of the box. This measure provides increased stability, rigidity and torsional stiffness to the packaging box. Conversely, the front small-edge/minor side of the box, and thus the corresponding rims of the base and lid portions, may have a central portion free of uncompressed area portions or reinforcing inserts, saving material and leaving space for additional items to be packaged such as accessories (manuals, cables, installation software etc.).

[0032] In another advantageous embodiment, the packaging inserts, the reinforcing inserts and/or the cushioning inserts comprise recesses in which additional cushioning elements are provided. These additional cushioning elements serve to appropriately distance the edges of the flat sensitive object from the uncompressed area portions or the reinforcing inserts, in a direction parallel to the face sheets, so that cushioning is also provided in this direction, parallel to the flat object.

[0033] These cushioning elements are preferably rolled-up or folded cushioning inserts. By rolling them up or folding them, the cushioning inserts acquire a very high degree of resilience, thus providing superior cushioning in the direction parallel to the flat object.

[0034] It is particularly advantageous that the inserts are glued to the rims of the base and the lid portions. Thus, any relative movement between insert and base and lid portions is prevented, improving overall stability.

Brief description of drawings

[0035] In the following, embodiments of the invention will be described by way of example with the aid of the appended drawings, in which:

Figure 1 is a sectional view of a dual-purpose packaging insert of a packaging box according to the invention, with Figure 1a showing a vertical cross section through the packaging insert and Figure 1b showing a section of the packaging insert taken along the line B-B of Figure 1a;

Figure 2 is a perspective view of a packaging box according to the invention when the box is open;

Figure 3 is a perspective view of a detail of the packaging box of Figure 2, showing the packaging insert in position within the box, and

Figure 4 is a sectional view of a cushioning element to be inserted in recesses in the inserts of the packaging box of the invention.

5 Detailed description

[0036] In Figure 1, a dual-purpose packaging insert 1 of a packaging box according to the invention is schematically shown in a sectional view. The insert comprises a core of honeycomb paper material that is comprised of a plurality of cells 10 that are substantially regularly arranged between an upper face sheet 14, 16 and a lower face sheet 15 of cardboard or, preferably, paper, such as Kraft paper. The cells are formed by upright walls 11, which in the present example are zigzagshaped paper strips arranged next to each other and connected, for example by gluing, at their apices 12 (see figure 1b). Here, the cells 10 are substantially square-shaped, however it will be understood that other shapes, such as hexagonal (true honeycomb), diamond shape etc. are possible. The packaging insert 1 has an uncompressed area portion 20 in which the cell walls 11 of the cells are undeformed and extend between the opposing planes defined by the upper face sheet 14 and the lower face sheet 15. The uncompressed area portion provides good rigidity and torsional stability due to the core made of uncrushed, substantially straight-walled cells.

[0037] The packaging insert 1 further comprises a compressed area portion 30, the thickness of which is smaller than the thickness of the uncompressed area portion 20, and in which the cells 10 have been partially crushed due to compression said portion has undergone during manufacturing. It is to be observed that the cell walls of the compressed area portion 30 are deformed along a certain height of the cell, as shown by crushed cell wall portions 13a in Figure 1a, while the remaining height of these cells may remain substantially intact with a substantially straight cell wall portion 13b. In general, the degree of resilience required in the compressed area portion will determine if the cell is crushed along its entire height (high resilience), or only along a part of the height, thus forming partially deformed cells with deformed cell wall portions 13a and undeformed cell wall portions 13b. It is noted that in the process of compressing the uncompressed honeycomb precursor during manufacture the cells walls may either cede or deform in the upper part (just below the face sheet 16), with the undeformed cell walls below (above the bottom face sheet 15), or vice versa. It may also occur that both types of arrangement occur together in the same compressed area portion 30, that is with upper compressed cell wall portions 13a in one set of crushed cells and lower compressed cell wall portions in the adjacent set of crushed cells.

[0038] The compressed area portion provides, due to the bellows-like deformation of the cell walls, a good degree of resilience against forces acting perpendicularly to the plane of the face sheet (plane of the insert), and are thus capable to efficiently absorb impacts or mechan-

ical shocks acting onto the insert. In this manner, objects placed onto the face sheet 16 of the compressed area portion 30 are well protected against damage.

[0039] As can further be seen from Figure 1, the core between facing sheets 14, 16 on the upper side of the insert and the face sheet 15 on the lower side extends continuously from the uncompressed area portion 20 to the compressed area portion 30, that is the honeycomb cell structure is not interrupted at the transition from one area portion to the other. This means that the physical properties of the uncompressed area portion 20 (torsional stiffness, rigidity) extend to a certain amount also into the neighbouring compressed area portion 30, in other words the packaging insert as a whole achieves good mechanical stability across the entire insert. Figure 2 shows a packaging box according to the invention that is designed to hold a flat panel TV screen, that is a flat object sensitive to mechanical shocks. The box comprises a base portion 110 and a lid portion 112 made of generally flat corrugated cardboard, and the base and the lid portions 110, 112 are connected to each other by a hinge portion 114 also of the corrugated cardboard. Although in the present example the base, lid and hinge portions 110, 112 and 114 are rectangular flat corrugated cardboard, it is to be understood that other geometries, such as octagonal base and lid portions with a rectangular hinge, are equally possible within the framework of the present invention.

[0040] The box in Figure 2 is shown in its opened state, in which the base portion 110 lies horizontally, and the lid portion 110 is raised into a vertical position, pivoting about the hinge portion 114. The hinge portion 114 is connected to the base portion 110 and the lid portion 112 via kinks or bends 115 in the cardboard, as is commonly known. The base and the lid portions 110, 112 have rims 140 which are comprised of foldable edge portions 141, 142 of the cardboard. The foldable edge portions 141, 142 are provided, generally at the front rim of the box, with openings 143, 144 which, in the closed state of the box, provide space to grasp the box easily.

[0041] At the corners 145 of the rims 140 of the base portion 110 and the lid portion 112, there are provided packaging inserts 101 (L-shape), 101' (mirror-inverted L-shape) which have the generic cross-sectional structure of figure 1 and which each comprise an uncompressed area portion 120 and a compressed area portion 130. The uncompressed area portion is provided at the rim 140, while the compressed area portion 130 is provided towards the inner space of the box on the lid and base portions 110, 112.

[0042] As can be seen in Figure 3, showing a detailed view of a corner of the packaging box 100 of the invention, the packaging insert 101' is L-shaped and is adapted perfectly to the corner and the lateral side 152 of the base (or lid). The foldable edge portions 141, 142 are folded inward by 90° from the base and lid portions 110, 112 so as to form, together with the flat corrugated cardboard of the base and lid portions 110, 112, substantially a square

C-shape in cross section that becomes the small-edge or minor side of the box. They are folded over and around two sides of the uncompressed area portion 120 of the packaging insert 101, 101' so that the foldable edge portion 141 forms a vertical-oriented side on the open side of the insert (perpendicular to the face sheets 14, 15), while the foldable edge portion 142 overlies the face sheet of the packaging inserts 101, 101'. The foldable edge portion 142 is fastened, preferably glued, to the packaging inserts 101, 101' (at the top, on face sheet 14), as is the corrugated cardboard of the base and lid portions, which is glued to the lower face sheet 15 of the packaging insert 101, 101'. Preferably, the glue used is a hot-melt glue, but other adhesives or fixing elements may be contemplated, too.

[0043] Returning to Figure 2, the packaging inserts 101, 101' are provided in this embodiment not only in correspondence of the corners 145 of the rim 140, but also extend along opposing sides 150, 152 of the base and lid portions 110, 112. Thus, superior structural rigidity is afforded to the base and lid, and therefore to the complete box. In the present case, the L-shaped packaging inserts 101, 101' extend along the opposing sides 150, 152 not only with their uncompressed area portions 120 but provide also the compressed area portions 130 along the sides 150, 152 right behind the uncompressed area portion 120. In this manner, a very large cushioning surface can be provided for the flat panel TV set, which notably improves its cushioning.

[0044] The packaging inserts 101, 101' comprise cut-outs or recesses 125, arranged partially in the uncompressed and partially in the compressed area portions 120, 130, and into which cushioning elements 160 made of crushed honeycomb material are inserted. In the specific example shown in Figure 4, the cushioning elements 160 are formed by a rolled-up piece of crushed honeycomb paper board, which provides a very high degree of cushioning in all directions. The cushioning element is formed by providing spaced apart sections of crushed honeycomb core material 161a-c, each having its own top face sheet 164a-c, on a common bottom face sheet 165. When rolled up, the left and right honeycomb cores 161a and 161c come to lie with their lateral sides onto the face sheet 164b of the centre honeycomb core 161b. In this manner, the cushioning insert can provide cushioning in all directions perpendicular to its bottom face sheet 165.

[0045] Returning again back to Figure 2, the cushioning elements 160 of the present example are arranged so that they protrude from the uncompressed area portion of the insert in a direction towards the compressed area portion, therefore defining resilient cushioning surfaces against which the flat object to be packaged abuts in a direction of the plane of the packaging insert (plane of the face sheet).

[0046] Further, cushioning inserts 160 made of crushed honeycomb paper board, which corresponds to the compressed area portions of the inserts 101, 101',

are arranged and glued onto the hinge portion 114.

[0047] Therefore, and as can be understood from Figure 2, the flat object to be packaged in the packaging box 100 is laid onto the compressed area portions 130 of the packaging inserts 101, 101' of the base portion 110, which provide cushioning in a direction perpendicular to the base 110. In a direction parallel to the base 110, the flat object is securely held and resiliently cushioned by means of the cushioning elements 160 and the cushioning inserts 170, which provide the cushioning effect in the plane of the base 110 and the lid 112. Closing the lid portion 112 onto the base portion 110 thus sandwiches and locks the flat object from all sides, protecting it securely against mechanical shock.

[0048] In use, the packaging box is laid flat on its base portion 110 and the lid portion 112 is opened. The sensitive flat object, such as a flat panel TV, is placed onto the compressed area portions 130 of the inserts 101, 101' of the base portion 110, and abutted from three sides (front, left, right) by the cushioning elements 160 of the base portion 110. Then the lid portion 112 is closed, and the equivalent compressed area portions 130 and the cushioning elements 160 of the inserts 101, 101' of the lid portion 112 abut and securely hold the sides of the flat object, with the cushioning insert 170 providing cushioning from the rear side, in correspondence to the hinge portion 114. The box can now be secured with adhesive tape or any other suitable means, preferably around the front and lateral sides of the box.

[0049] Due to the reinforcing action of the uncompressed area portions along the corners and lateral sides of the box, in conjunction with the square C-shape rim structure of the foldable edge portions glued thereto, the packaging box of the invention acquires a high degree of torsional stiffness, rigidity and strength, which allow the box to be stacked on pallets, and shipped and handled in a horizontal position, without damage to the rims or the packaging inserts of the box.

Claims

1. A packaging box (100) for a flat object sensitive to mechanical shock, comprising a base and a lid portion (110, 112) made of generally flat corrugated cardboard, wherein rims (140) of the base and the lid portions (110, 112) are comprised of foldable edge portions (141, 142) of the cardboard, the base and lid portions (110, 112) are provided with one or more dual-purpose packaging inserts (1) having a core made of a plurality of hollow cells (10) defined by cell walls (11), the hollow cells defining opposing planar sides which are substantially perpendicular to the cell walls and at least one of which is covered by a face sheet (14, 16), wherein the packaging insert(s) (1) comprise(s) an uncom-

pressed area portion (120) of a given thickness, with undeformed cell walls (11) extending between the opposing planar sides, thus providing structural stiffness and rigidity, and

a compressed area portion (130) of a smaller thickness, with the compressed area portion's cell walls (13a, b) being at least partially deformed so as to provide resilience and cushioning in a direction perpendicular to the planar sides, wherein the core extends continuously from the uncompressed area portion (120) into the compressed area portion (130), wherein the uncompressed area portion(s) (120) is/are provided at least at the corners (145) of the rims (140) of the base and the lid portions to provide structural stiffness and rigidity to the box, and the compressed area portion(s) (130) is/are provided at the base and the lid portion (110, 112) so as to receive and resiliently hold the flat object when the base and lid portions are closed, and thus to provide cushioning to the flat object in a direction perpendicular to the planar sides, wherein the foldable edge portions (141, 142) of the rims (140) are folded over and around at least two sides of the reinforcing inserts.

2. The packaging box (100) of claim 1, wherein the perimeter of the uncompressed area portion(s) (20) and/or the compressed area portion(s) (30) comprises a curved or angled line, wherein the angled line comprises at least one not substantially right angle.
3. The packaging box (100) of claim 1 or 2, wherein the insert is L-shaped.
4. A packaging box (100) for a sensitive flat object, comprising a base and a lid portion (110, 112) made of generally flat corrugated cardboard, wherein the rims (140) of the base and the lid portion (110, 112) are comprised of foldable edge portions (141, 142) of the cardboard, whereby the rims (140) of the base and the lid portions are provided at least at the corners of the rims with reinforcing inserts (101, 101') made of honeycomb paper structures having a core (120) made of a plurality of uncompressed hollow cells defined by undeformed cell walls extending between and defining opposing planar sides which are substantially perpendicular to the cell walls and at least one of which is covered by a face sheet, the reinforcing inserts thus providing structural stiffness and rigidity to the box, and the base (110) and lid (112) portions are provided with cushioning inserts made of honeycomb paper structures having a core made of a plurality of compressed hollow cells (130) defined by at least partially deformed cell walls extending between and de-

fining opposing planar sides which are substantially perpendicular to the cell walls and at least one of which is covered by a face sheet, so as to receive and resiliently hold the flat object when the base and lid portions are closed, and thus to provide cushioning to the flat object in a direction perpendicular to the planar sides, and
 wherein the foldable edge portions (141, 142) of the rims (140) are folded over and around at least two sides of the uncompressed area portions (120).

5. The packaging box of claim 4, wherein the perimeter of the cushioning inserts and/or of the reinforcing inserts comprises a curved or angled line, wherein the angled line comprises at least one not substantially right angle.
6. The packaging box (100) of any of claims 1 to 5, wherein the base and lid portions (110, 112) are connected to each other by a hinge portion (114) of the cardboard so as to open or close the box.
7. The packaging box (100) of claim 6, wherein the hinge portion (114) is a flat rectangular portion of the cardboard.
8. The packaging box (100) of any of claims 6 or 7, wherein the box further comprises second reinforcing and/or cushioning inserts (170) arranged at the hinge portion (114).
9. The packaging box of any of claims 1 to 8, wherein the uncompressed area portions (120) of the dual-purpose packaging insert (1) or the reinforcing inserts are further provided along two opposing sides (150, 152) of the rims (140) adjacent to the hinge portion (114).
10. The packaging box of any of claims 1 to 9, wherein the packaging inserts (1), the reinforcing inserts and/or the cushioning inserts comprise recesses (125) in which additional cushioning elements (160) are provided.
11. The packaging box of claim 10, wherein the cushioning elements (160) are rolled-up or folded cushioning inserts.
12. The packaging box of any of claims 1 to 11, wherein the packaging inserts (1) are glued to the rims (140) of the base and the lid portions (110, 112).

Patentansprüche

1. Verpackungsbehältnis (100) für ein flaches Objekt, das empfindlich ist gegen mechanische Stöße, mit einem Basis- und einem Deckelabschnitt (110, 112)

aus im Allgemeinen flacher Wellpappe, wobei Ränder (140) der Basis- und Deckelabschnitte (110, 112) aus faltbaren Randabschnitten (141, 142) des Kartons bestehen, wobei die Basis- und Deckelabschnitte (110, 112) mit einem oder mehreren Doppelzweck-Verpackungseinsätzen (1) versehen sind, mit einem Kern, der aus einer Vielzahl von hohlen Zellen (10) ausgebildet ist, die durch Zellwände (11) definiert sind, wobei die hohlen Zellen gegenüberliegende ebene Seiten definieren, die im Wesentlichen senkrecht zu den Zellwänden stehen, und von denen mindestens eine mit einer Außenschicht (14, 16) bedeckt ist, wobei der Verpackungseinsatz bzw. die Verpackungseinsätze (1) einen unkomprimierten Flächenabschnitt (120) einer vorgegebenen Dicke aufweist bzw. aufweisen, mit nicht deformierten Zellwänden (11), die sich zwischen den gegenüberliegenden ebenen Seiten erstrecken, wodurch strukturelle Steifigkeit und Festigkeit bereitgestellt ist, und einen komprimierten Flächenabschnitt (130) kleinerer Dicke, wobei die Zellwände (13a, 13b) des komprimierten Flächenabschnitts mindestens partiell deformiert sind, um so Elastizität und Polsterung in einer Richtung senkrecht zu den ebenen Seiten bereitzustellen, wobei sich der Kern kontinuierlich von dem unkomprimierten Flächenabschnitt (120) in den komprimierten Flächenabschnitt (130) erstreckt, wobei der bzw. die unkomprimierten Flächenabschnitt(e) (120) zumindest bei den Ecken (145) der Ränder (140) der Basis- und der Deckelabschnitte bereitgestellt ist/sind, um den Karton mit struktureller Steifigkeit und Festigkeit zu versehen, und wobei der/die komprimierten Flächenabschnitt(e) (130) bei dem Basis- und dem Deckelabschnitt (110, 112) bereitgestellt ist/sind, um so das flache Objekt aufzunehmen und elastisch zu halten, wenn die Basis- und Deckelabschnitte geschlossen sind, und daher für eine Polsterung des flachen Objekts in einer Richtung senkrecht zu den ebenen Seiten zu sorgen, wobei die faltbaren Randabschnitte (141, 142) der Ränder (140) über und um mindestens zwei Seiten der verstärkenden Einlagen gefaltet sind.

2. Verpackungsbehältnis (100) nach Anspruch 1, bei dem der Umfang des unkomprimierten Flächenabschnitts bzw. der unkomprimierten Flächenabschnitte (120) und/oder des komprimierten Flächenabschnitts bzw. der komprimierten Flächenabschnitte (130) eine gekrümmte oder abgewinkelte Linie aufweist, wobei die abgewinkelte Linie mindestens einen im Wesentlichen nicht rechten Winkel aufweist.
3. Verpackungsbehältnis (100) nach Anspruch 1 oder 2, bei dem der Einsatz L-förmig ist.

4. Verpackungsbehältnis (100) für ein empfindliches flaches Objekt, mit einem Basis- und einem Deckelabschnitt (110, 112) aus im Wesentlichen flacher Wellpappe, wobei die Ränder (140) der Basis- und der Deckelabschnitte (110, 112) aus faltbaren Randabschnitten (141, 142) des Kartons aufgebaut sind, wobei die Ränder (140) der Basis- und der Deckelabschnitte zumindest bei den Ecken der Ränder mit verstärkenden Einsätzen (101, 101') versehen sind, die aus Wabenpapierstrukturen mit einem Kern (112) ausgebildet sind, der aus einer Vielzahl unkomprimierter hohlen Zellen ausgebildet ist, die durch nicht deformierte Zellwände definiert sind, die sich zwischen gegenüberliegenden ebenen Seiten erstrecken und diese definieren, die im Wesentlichen senkrecht zu den Zellwänden stehen, und von denen mindestens eine mit einer Außenschicht bedeckt ist, wobei die verstärkenden Einsätze daher dem Karton strukturelle Steifigkeit und Festigkeit verleihen, und wobei die Basis- (110) und Deckelabschnitte (112) mit polsternden Einsätzen versehen sind, die aus Wabenpapierstrukturen mit einem Kern ausgebildet sind, der aus einer Vielzahl komprimierter hohlen Zellen (130) ausgebildet ist, die durch zumindest partiell deformierte Zellwände definiert sind, die sich zwischen gegenüberliegenden ebenen Seiten erstrecken und diese definieren, welche im Wesentlichen senkrecht zu den Zellwänden stehen, und von denen mindestens eine mit einer Außenschicht bedeckt ist, um so das flache Objekt aufzunehmen und elastisch zu halten, wenn die Basis- und Deckelabschnitte geschlossen sind, und daher für eine Polsterung des flachen Objekts in einer Richtung senkrecht zu den ebenen Seiten zu sorgen, und wobei die faltbaren Kantenabschnitte (141, 142) der Ränder (140) über und um mindestens zwei Seiten der unkomprimierten Flächenabschnitte (120) gefaltet sind.
5. Verpackungsbehältnis (100) nach Anspruch 4, bei dem der Umfang der polsternden Einsätze und/oder der verstärkenden Einsätze eine gekrümmte oder abgewinkelte Linie aufweist, wobei die abgewinkelte Linie mindestens einen im Wesentlichen nicht rechten Winkel aufweist.
6. Verpackungsbehältnis (100) nach einem der Ansprüche 1-5, bei dem die Basis- und Deckelabschnitte (110, 112) miteinander mittels eines Gelenkabschnitts (114) des Kartons verbunden sind, um so den Karton zu öffnen oder schließen.
7. Verpackungsbehältnis (100) nach Anspruch 6, bei dem der Gelenkabschnitt (114) ein flacher rechteckiger Abschnitt des Kartons ist.

8. Verpackungsbehältnis (100) nach einem der Ansprüche 6 oder 7, bei dem der Karton ferner zweite verstärkende und/oder polsternde Einsätze (170) aufweist, die bei dem Gelenkabschnitt (114) angeordnet sind.
9. Verpackungsbehältnis nach einem der Ansprüche 1-8, bei dem die unkomprimierten Flächenabschnitte (120) des Doppelzweck-Verpackungseinsatzes (1) oder die verstärkenden Einsätze ferner entlang von zwei gegenüberliegenden Seiten (150, 152) der Ränder (140) neben dem Gelenkabschnitt (114) bereitgestellt sind.
10. Verpackungsbehältnis nach einem der Ansprüche 1-9, bei dem die Verpackungseinsätze (1), die verstärkenden Einsätze und/oder die polsternden Einsätze Vertiefungen (125) aufweisen, in denen zusätzliche polsternde Elemente (160) vorgesehen sind.
11. Verpackungsbehältnis nach Anspruch 10, bei dem die polsternden Elemente (160) aufgerollte oder gefaltete polsternde Einsätze sind.
12. Verpackungsbehältnis nach einem der Ansprüche 1-11, bei dem die Verpackungseinsätze (1) an die Ränder (140) der Basis und der Deckelabschnitte (110, 112) geleimt sind.

Revendications

1. Boîte d'emballage (100) destinée à un objet plat sensible aux chocs mécaniques, comprenant une partie base et une partie couvercle (110, 112), réalisées en carton ondulé généralement plat, dans laquelle des bords (140) de la partie base et de la partie couvercle (110, 112) sont constitués de parties bord pliables (141, 142) du carton, la partie base et la partie couvercle (110, 112) sont munies d'un ou de plusieurs inserts d'emballage (1) à double fin, comportant un noyau constitué d'une pluralité d'alvéoles creuses (10) délimitées par des parois d'alvéoles (11), les alvéoles creuses définissant des côtés plans qui se font face et qui sont substantiellement perpendiculaires aux parois des alvéoles et dont au moins un est recouvert par une feuille de surface (14, 16), dans laquelle l'insert d'emballage (les inserts d'emballage) (1) comprend/comprennent une partie (120) formant une zone non comprimée d'une épaisseur donnée, comportant des parois d'alvéoles (11) non déformées qui s'étendent entre les côtés plans qui se font face, ce qui procure une raideur et une rigidité structurelles, et une partie (130) formant une zone comprimée de plus faible épaisseur, les parois d'alvéoles (13a, b)

- de la partie zone comprimée étant au moins partiellement déformées, afin de procurer de l'élasticité et un effet d'amortissement dans une direction perpendiculaire aux côtés plans,
- dans laquelle le noyau s'étend de façon continue depuis la partie (120) formant une zone non comprimée jusqu'à la partie (130) formant une zone comprimée,
- dans laquelle la partie (les parties) (120) formant une zone non comprimée (des zones non comprimées) est/sont disposée(s) au moins au niveau des coins (145) des bords (140) de la partie base et de la partie couvercle afin de procurer à la boîte une raideur et une rigidité structurelles, et
- la partie (les parties) (130) formant une zone comprimée (des zones comprimées) étant ménagée(s) au niveau de la partie base (110) et de la partie couvercle (112) de manière à recevoir et à maintenir élastiquement l'objet plat lorsque la partie base et la partie couvercle sont en position de fermeture, et ainsi à procurer un effet d'amortissement pour l'objet plat dans une direction perpendiculaire aux côtés plans,
- dans laquelle les parties bord pliables (141, 142) des bords (140) sont pliées au-dessus et autour d'au moins deux côtés des inserts de renforcement.
2. Boîte d'emballage (100) selon la revendication 1 dans laquelle le périmètre de la partie non comprimée (20), ou des parties non comprimées (20), et/ou de la partie comprimée (30) ou des parties comprimées (30) présente(nt) une ligne courbe ou anguleuse, la ligne anguleuse présentant au moins un angle qui n'est pas substantiellement un angle droit.
 3. Boîte d'emballage (100) selon la revendication 1 ou 2 dans laquelle l'insert a une forme de L.
 4. Boîte d'emballage (100) destinée à un objet plat fragile, comprenant une partie base et une partie couvercle (110, 112) réalisées en carton ondulé généralement plat, dans laquelle les bords (140) de la partie base et de la partie couvercle (110, 112) comportent des parties de bord pliables (141, 142) du carton, les bords (140) de la partie base et de la partie couvercle étant munis, au moins, au niveau de leur angles d'inserts de renforcement (101, 101') constitués de structure en papier nid d'abeilles comportant un noyau (120) constitué d'une pluralité d'alvéoles creuses non comprimées délimitées par des parois d'alvéoles non déformées qui s'étendent entre des côtés plans qui se font face et qui définissent celles-ci, qui sont substantiellement perpendiculaires aux parois d'alvéoles et dont au moins un desquels est recouvert d'une feuille de surface, les inserts de renforcement procurant ainsi une raideur et une rigidité structurelles à la boîte, et,
- la partie base (110) et la partie couvercle (112) étant munies d'inserts amortisseurs constitués de structure en papier nid d'abeilles dotés d'un noyau constitué d'une pluralité d'alvéoles creuses comprimées (130) délimitées par des parois d'alvéoles au moins partiellement déformées qui s'étendent entre des côtés plans qui se font face en définissant ceux-ci et qui sont substantiellement perpendiculaires aux parois des alvéoles et dont au moins un est recouvert par une feuille de surface de manière à recevoir et à maintenir élastiquement l'objet plat lorsque la base et le couvercle sont en position de fermeture, et ainsi à procurer un effet d'amortissement pour l'objet plat dans une direction perpendiculaire aux côtés plans, et
- dans laquelle les parties de bord pliables (141, 142) des bords (140) sont pliées au-dessus et autour d'au moins deux côtés des parties formant une zone non comprimée (120).
5. Boîte d'emballage selon la revendication 4 dans laquelle le périmètre des inserts d'amortissement et/ou des inserts de renforcement présente une ligne courbe ou anguleuse, la ligne anguleuse comprenant un angle qui n'est pas substantiellement un angle droit.
 6. Boîte d'emballage (100) selon l'une quelconque des revendications 1 à 5 dans laquelle la partie base et la partie couvercle (110, 112) sont reliées l'une à l'autre par une zone du carton formant charnière (114) de manière à ouvrir ou fermer la boîte.
 7. Boîte d'emballage (100) selon la revendication 6 dans laquelle la zone formant charnière (114) est une partie rectangulaire plate du carton.
 8. Boîte d'emballage (100) selon l'une quelconque des revendications 6 ou 7 dans laquelle la boîte comprend en outre des seconds inserts de renforcement et/ou d'amortissement (170) agencés au niveau de la zone formant charnière (114).
 9. Boîte d'emballage selon l'une quelconque des revendications 1 à 8 dans laquelle les parties zones non comprimées (121) de l'insert d'emballage (1) à double fin ou bien les inserts de renforcement sont disposés en outre le long de deux côtés opposés (150, 152) des bords (140) adjacents aux zones formant charnières (114).
 10. Boîte d'emballage selon l'une quelconque des revendications 1 à 9 dans laquelle les inserts d'emballage (1), les inserts de renforcement et/ou les inserts d'amortissement comportent des creux (125) dans lesquels sont disposés des éléments d'amortissement additionnels (160).

11. Boîte d'emballage selon la revendication 10 dans laquelle les éléments d'amortissement (160) sont des inserts d'amortissement enroulés ou pliés.
12. Boîte d'emballage selon l'une quelconque des revendications 1 à 11 dans laquelle les inserts d'emballage (1) sont collés sur les bords (140) de la partie base (110) et de la partie couvercle (112).

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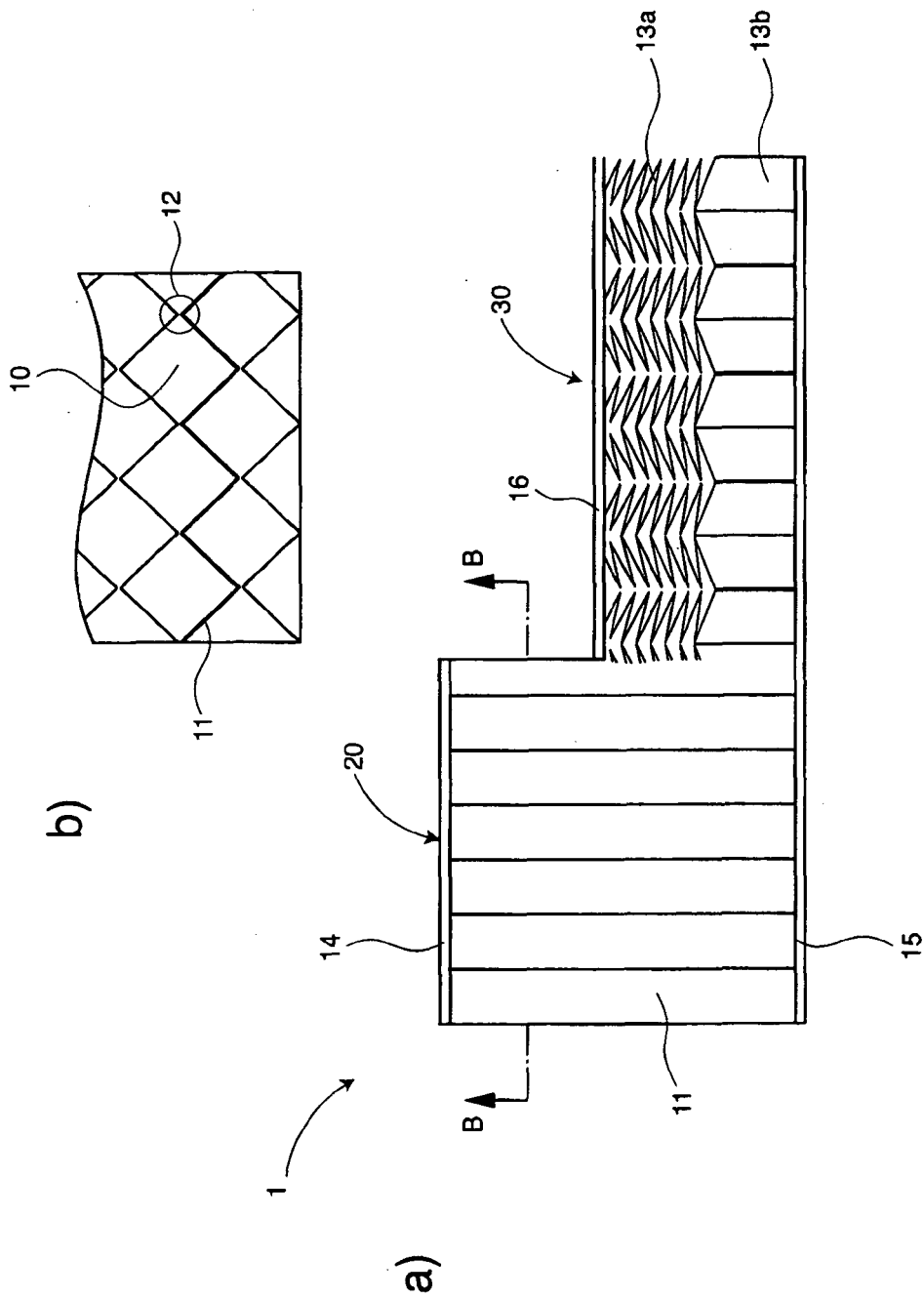


Fig. 1

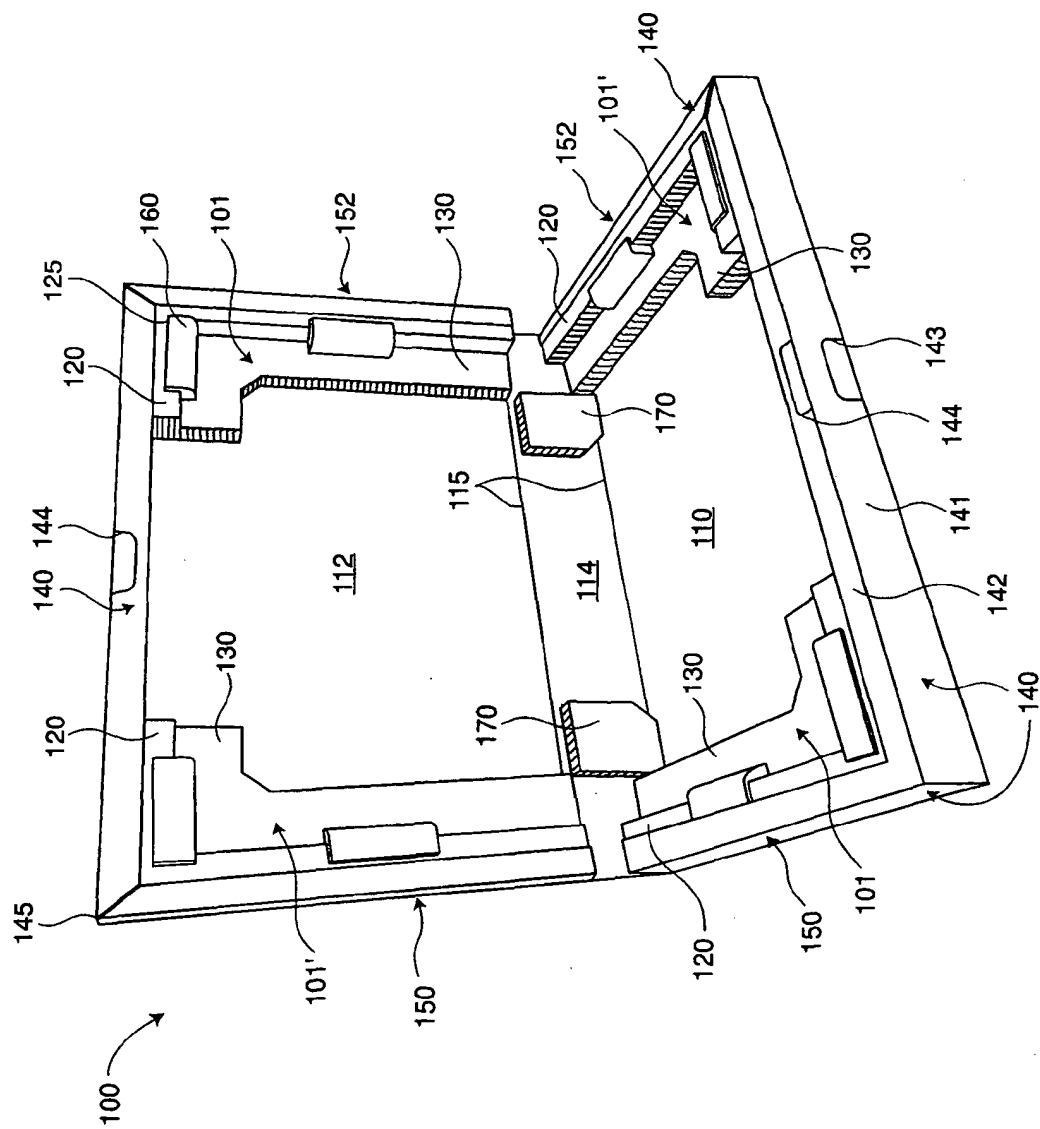


Fig. 2

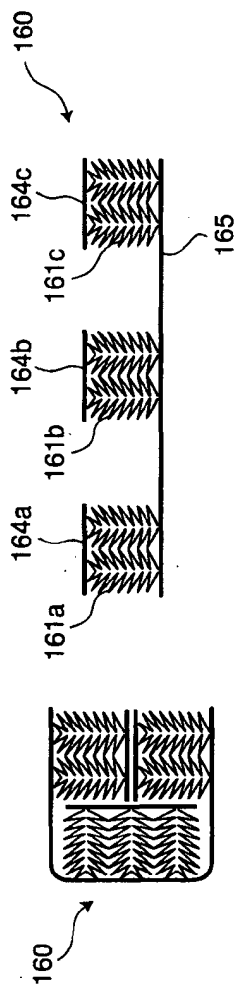


Fig. 4

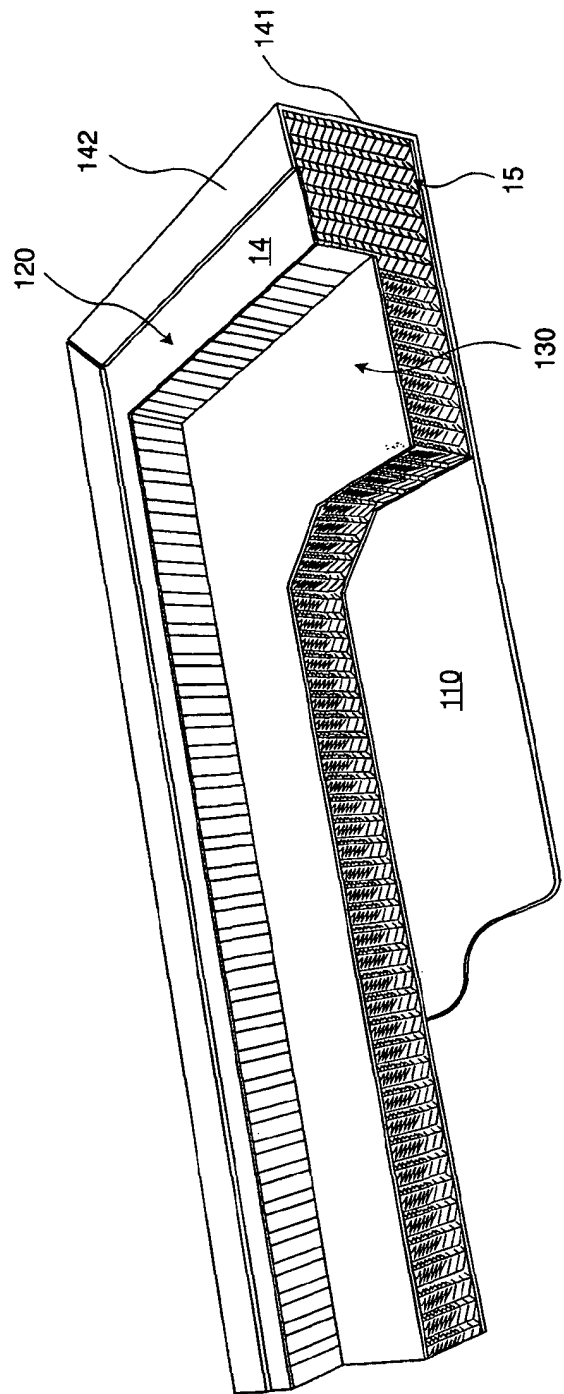


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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