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(54) **PACKAGING STRUCTURE**

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(57) **ABSTRACT**

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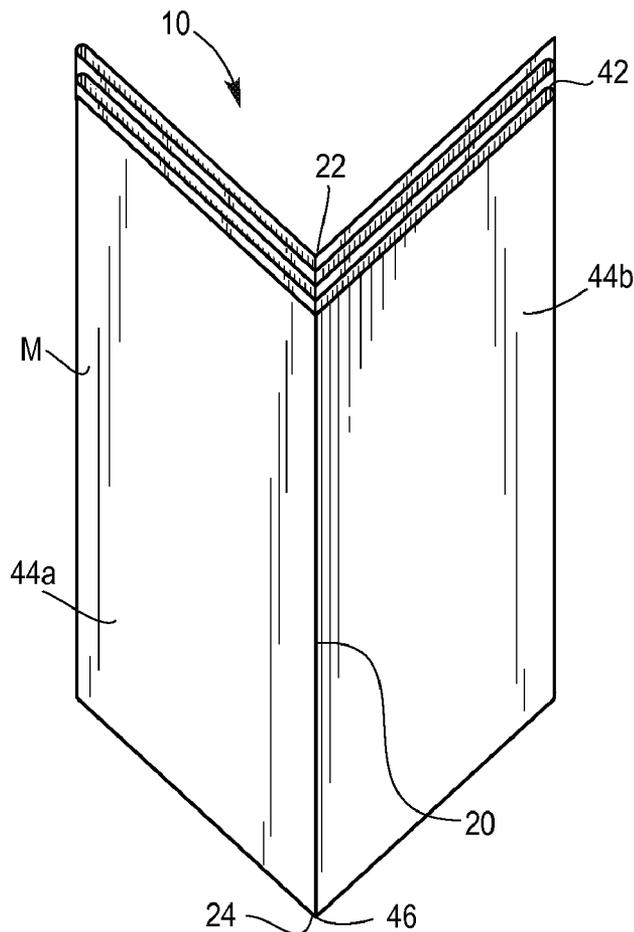
A rigid, shaped board structure is formed from a sheet of material having a length and width. The sheet has a first side and a second side. The sheet of material is folded in an accordion fold defining a plurality of flutes. The flutes have first and second legs opposing one another, defined by parallel material fold lines such that a width of the first legs is about equal to a width of the second legs. An adhesive is applied on at least one of each opposing first and second legs. The sheet of material with the adhesive thereon is compressed to fold along the fold lines to form a flat compressed board. The flat compressed board is folded along at least one board fold line parallel to the material fold lines to form the rigid, shaped board structure.

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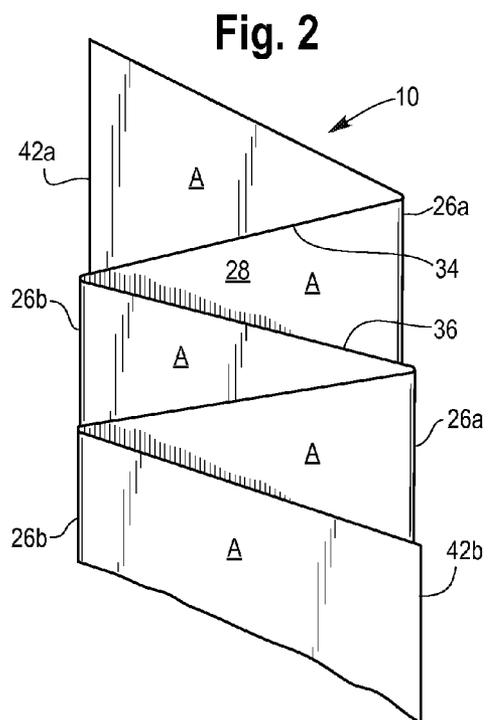
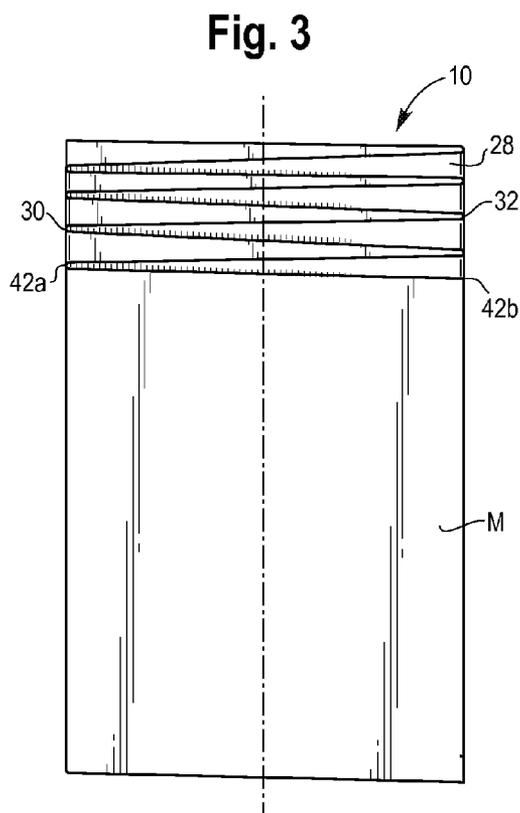
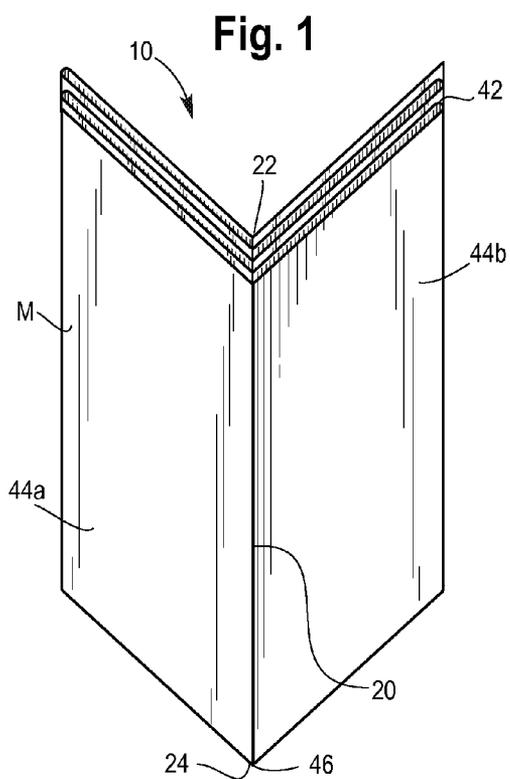


Fig. 4

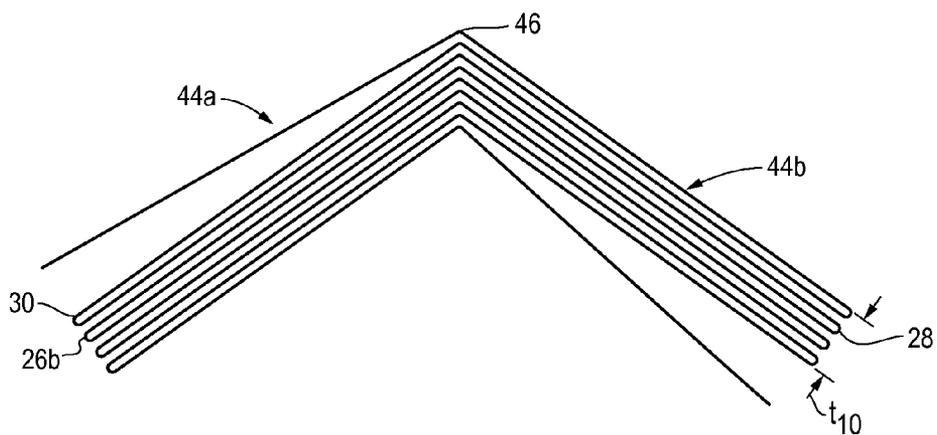


Fig. 5

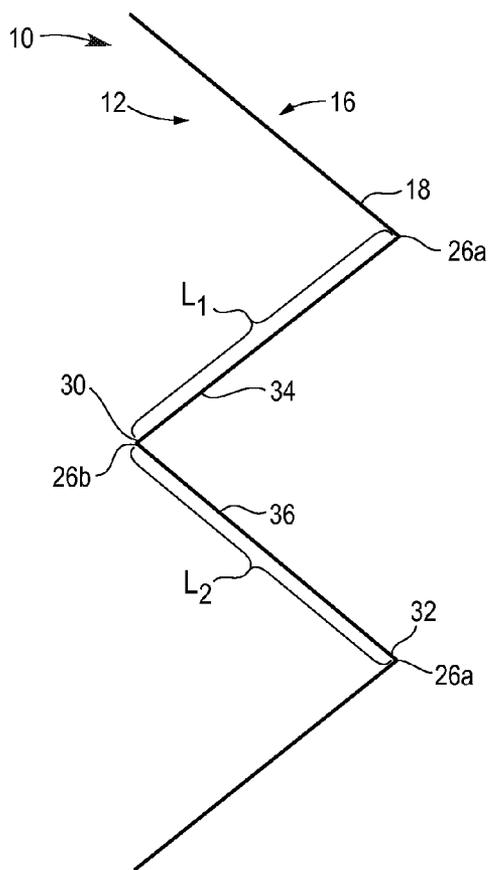


Fig. 6

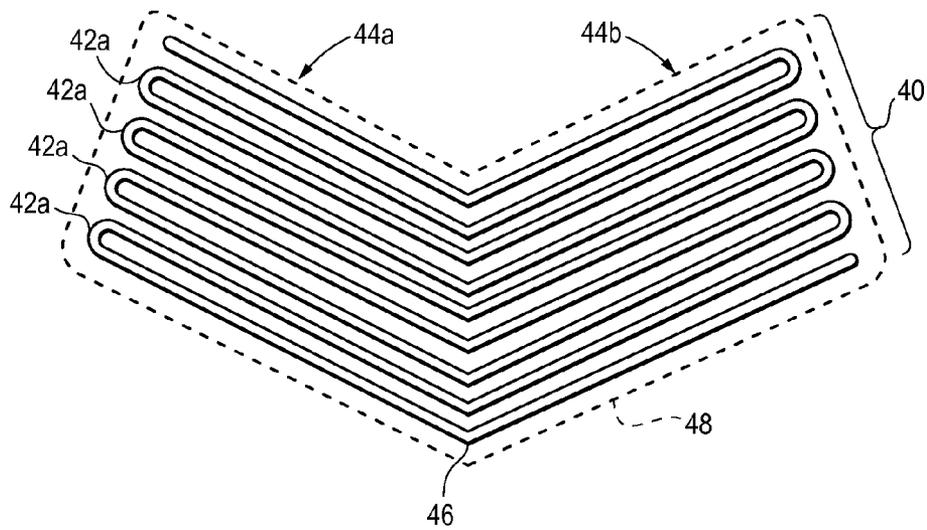
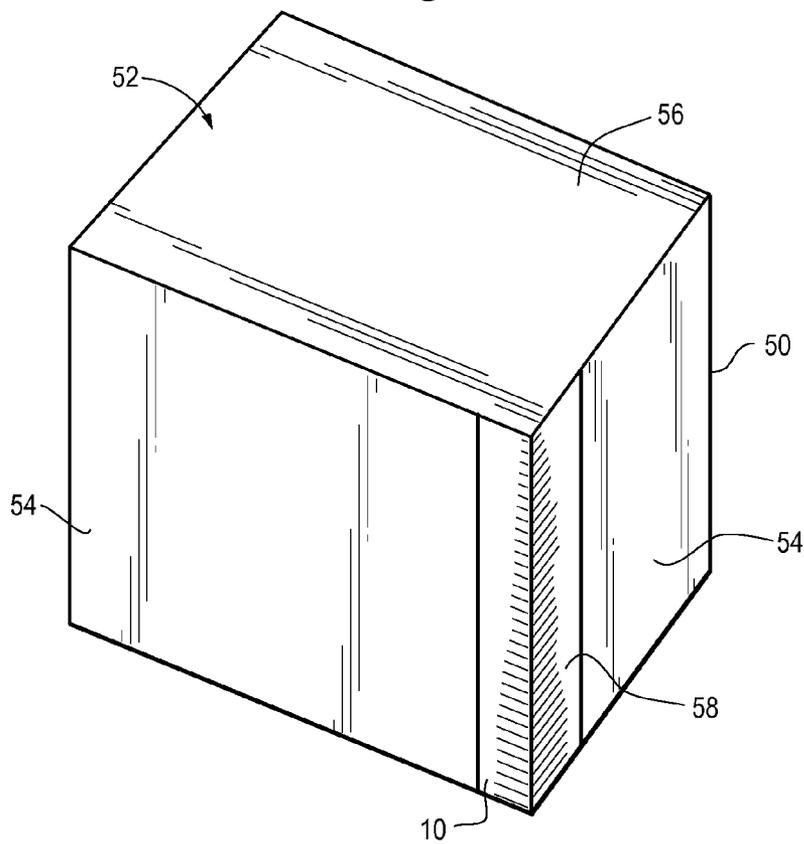


Fig. 7



PACKAGING STRUCTURE

BACKGROUND

[0001] Rigid packaging material made for corner protection, edge protection, stacking strength, and the like, such as Angleboard® and G-Board, commercially available from Illinois Tool Works, Inc., are all made using a similar basic technique, which includes cutting paper to a specific size and gluing together layer upon layer of the paper to create the structure. The thickness of the structure can be altered by varying the amount of layered paper and the amount of adhesive used.

[0002] These layers of paper can be made up of a composition of many different types of paper including, but not limited to, clay coated recycled board, uncoated recycled board, crème face, gypsum, felt paper, news back board, medium, and liner board. After the materials are laminated together, the product is formed to a desired shape, such as a 90 degree angle board.

[0003] Laminated, shaped packaging has been used for packaging loads which require edge protection, load unitization, load stability, beam strength, and stacking strength. These materials eliminate the need for corrugated cartons and dramatically reduce the amount of material needed to ship and store loads.

[0004] While laminated, shaped packaging has been used with a great deal of success for packaging items, its strength is often limited by differences in composition as well as the potential for delamination of the individual layers from the structure. Individual plies of paper have a tendency to pull away and delaminate, reducing the strength of the board structure.

[0005] G-board has a similar structure in that it is made in the traditional method of layering and laminating individual sheets of paper, to shape, for example, a 90 degree angle, and then folding the ends back over to meet in the middle. In this manner, the edges of the structure are covered. Again, the two issues here are that its strength is dependent on the type of paper that is used, and the apex of the angle has only half the paper that the outer portions or edges have.

[0006] To increase the strength of these structures, manufacturers have experimented with varying the type and percentage of each paper used in a given structure's composition. Similarly, attempts have been made to increase the strength of the product by varying the type of adhesive used, novel wrapping techniques, new types of paper, using plastics, and the like. These derivations have met with limited success of repeatable strength and performance. Often, the apex of the board remains intact and is the last area to be compromised before failure.

[0007] Accordingly, there is a need for a shaped packaging structure that does not delaminate when a load is applied to the structure. More desirably, such a structure can be readily manufactured from known materials, but requires less material than traditional structures and/or displays greater strength and integrity than comparable structures per unit weight.

SUMMARY

[0008] An embodiment of a rigid, shaped board structure is formed from a sheet of material having a length and width. The sheet has a first side and a second side. The sheet of material is folded in an accordion fold that defines a plurality of flutes. The flutes have first and second legs opposing one

another. The legs are defined by parallel material fold lines such that the width of the first legs is about equal to the width of the second legs.

[0009] An adhesive is on at least one of each opposing first and second leg. The sheet of material, with the adhesive thereon, is compressed to fold along the fold lines and forms a flat compressed board. The flat compressed board is folded along at least one board fold line that is parallel to the material fold lines to form the rigid, shaped board structure.

[0010] In an embodiment the sheet of material is made of a fibrous material, such as paper. The shaped board can be folded along the fold line at a 90° angle.

[0011] In embodiments, the board can include multiple board fold lines. The board, which has first and second edges, can have a wrapping thereover. The wrapping can also surround the board as a whole.

[0012] In an embodiment, the shaped board structure is formed from multiple sheets of material, with at least two of the sheets being folded in an accordion fold.

[0013] The board structure can be made by folding a sheet of material in an accordion fold to define a plurality of flutes. The flutes have first and second legs opposing one another that form parallel material fold lines such that a width of the first legs is about equal to a width of the second legs.

[0014] An adhesive can be applied to at least one of opposing first and second legs. The sheet of material with the adhesive thereon is compressed so that the material folds along the fold lines to form a flat compressed board. The flat compressed board is then folded along at least one board fold line, where the board fold line can be parallel to the material fold lines to form the rigid shaped board structure.

[0015] In an embodiment the sheet board material is made of a fibrous material, such as paper. The shaped board can be folded along the fold line at a 90° angle.

[0016] In an embodiment the board can include multiple board fold lines. A wrapping can be applied over the first and second edges. The wrapping can also be applied to surround the board as a whole.

[0017] In an embodiment, a method for making a packaging structure includes folding at least one sheet and further includes folding a second sheet of material along the material fold lines. In an embodiment, the board is folded at multiple board fold lines parallel to the material fold lines to form the rigid shaped board structure. In an embodiment, the method includes wrapping the folded, compressed board in a material. The method can include folding multiple sheets of material along material fold lines to form the board.

[0018] These and other features and advantages of the present disclosure will be apparent from the following detailed description, in conjunction with the appended claims.

DESCRIPTION OF THE DRAWINGS

[0019] The benefits and advantages of the present disclosure will become more readily apparent to those of ordinary skill in the relevant art after reviewing the following detailed description and accompanying drawings, wherein:

[0020] FIG. 1 is a perspective view of an embodiment of a packaging structure formed from a single sheet of material;

[0021] FIG. 2 is a perspective view of the material of the packaging structure folded in an accordion fold, prior to compression;

[0022] FIG. 3 is a perspective view of the compressed material, formed as a flat board, prior to forming to its final shape;

[0023] FIG. 4 is an end of a compressed and partially folded board;

[0024] FIG. 5 is an end view of the folded material, prior to compression;

[0025] FIG. 6 is an end view of the board as it is folded to its final shape; and

[0026] FIG. 7 is a perspective view of an embodiment of the board positioned on a load.

DETAILED DESCRIPTION

[0027] While the present device is susceptible of embodiment in various forms, there is shown in the drawings and will hereinafter be described various embodiments with the understanding that the present disclosure is to be considered an exemplification of the device and method is not intended to be limited to the specific embodiments disclosed.

[0028] Referring now to the figures and in particular to FIGS. 1-7, a packaging board 10 for use with bent and angled shaped corners and objects, includes a first side 12 with a first surface 14 and a second side 16 with a second surface 18. The board 10 has a longitudinal axis 20 extending from a first end 22 to a second end 24.

[0029] The board 10 is formed from a sheet of material M that is folded along a series of fold lines 26a, 26b placed at equal distances between the edges of the board 10. The plurality of longitudinally positioned fold lines 26a, 26b are parallel to the board's longitudinal axis 20.

[0030] The material M is folded along the fold lines 26a, 26b to create a series of V shaped flutes 28. The flutes 28 define peaks 30 and valleys 32, respectively on opposite sides with the peak 30 the first side 12 being the valley 32 on the second side 16, and vice versa. The flutes 28 extend in opposite directions from one another. For purposes of the present disclosure, the term end refers to the terminal ends of the board 10 or material M that forms the board 10, for example, as indicated at 22 and 24 in FIG. 1, and the term edge refers to the edges or extreme outer bounds of the board 10 or material M as indicated at 42a and 42b in FIGS. 1-3, the edges 42a, 42b being transverse to the ends 22, 24.

[0031] As shown in FIGS. 2-4, in a partially folded state in which the material is compressed, the flute 28 has a first flute leg 34 and second flute leg 36, that meet at a fold line, for example, 26b. As seen in FIG. 5, the first flute leg 34 has a first length L_1 and the second flute leg 36 has a second length L_2 . In an embodiment, the first flute leg length L_1 and second flute leg length L_2 can be substantially equal to each other.

[0032] As shown in FIG. 2, adhesive A is placed along the first flute leg 34, the second flute leg 36, or both flute legs 34, 36 of the fluted portions 28. The board 10 is then compressed to form a flat laminated structure as seen in FIG. 3, having folded edges 42a, 42b along the edge of the board 10.

[0033] After the flat board is formed, the flat board is folded to a desired final shape. For example, for an angle board, the board 10 is folded about 90° along the longitudinal axis 20 approximately equidistance from the alternating lateral fold lines 26a, 26b along the board 10. As the board 10 is folded along the longitudinal axis, two board legs 44a, 44b are formed. The board legs 44a, 44b extend outwardly from an apex 46 and, in an embodiment, can be substantially equal in length and density. The board 10 can be folded in a variety of different configurations, such as Angleboard®, U-board® (U-shaped cross-section with upstanding legs extending from a base wall), G-board, or the like. A wrap 48, as illustrated in FIG. 6 can be placed over individual edges, or the entire

structure. It will be appreciated that the board legs 44a, 44b of the board 10 are rigid along their lengths, as well as rigid relative to the apex of the board 46. That is, the legs 44a, 44b cannot be folded inward, toward one another—that is, the apex 46 is fixed or rigid.

[0034] As shown in FIG. 7, the board is used, for example, in protecting the corners 50 of a load 52, extending partially over the side surfaces 54 of the load 52. The board 10 can extend from a top surface 56 of the load 52 to a bottom surface (not shown) with the edges 44a, 44b forming columns 58.

[0035] The advantages of the present board structure will be appreciated by those with skill in the art. The present layered structure created from one or a minimal number of sheets uses less material than traditional boards, but retains the same or displays greater strength. It will be appreciated that the present board 10 is referred to as being formed from a single sheet of material M that is accordion folded to form a flat board laminated structure that is then folded to a desired final configuration (e.g., 90° angled board). It will be understood that multiple sheets can be used, so long as the sheets are accordion folded to form the longitudinal fold lines, e.g. 26a and 26b. For example, it may be that a single sheet of material may not have sufficient overall width such that when folded, it creates the desired thickness t_{10} (FIG. 4). In such an instance, two or more sheets of material may be needed to obtain the desired configuration, size, and thickness of the final board 10.

[0036] In column strength testing, the average strength of traditional Angleboard® was measured at 946 pounds. A similar sized present board structure exhibited column strength of 1,380 pounds, an increase of about 145%. In similar testing, a present board having 65% of the mass of a similarly sized traditional board retained 93% of the strength.

[0037] The shape and strength of the present board allows it to replace existing product with a board that contains less material, yet provides the same strength as the product it replaces. The increased column strength of the present board dues to the presence of the fold lines 26a and 26b lends itself to be used as a replacement in stacking applications, where the board is expected to reinforce a stack of product and support the additional weight when pallets are stacked on top of each other. The present board can also be used to replace the cross members in appliance packaging to prevent clamp trucks from damaging the load during handling. The present board can be used in any application that currently uses protection on corners or edges. The present board has a greater strength per board weight than traditional boards, and/or while reducing the amount of material needed, subsequently decreasing the cost of manufacture.

[0038] All patents referred to herein, are incorporated herein by reference, whether or not specifically done so within the text of this disclosure. In the present disclosure, the words “a” or “an” are to be taken to include both the singular and the plural. Conversely, any reference to plural items shall, where appropriate, include the singular.

[0039] From the foregoing it will be observed that numerous modifications and variations can be effectuated without departing from the true spirit and scope of the novel concepts of the present disclosure. It is to be understood that no limitation with respect to the specific embodiments illustrated is intended or should be inferred. The disclosure is intended to cover by the appended claims all such modifications as fall within the scope of the claims.

1. A rigid, shaped board structure, comprising:
a sheet of material having a length and width, the sheet of material having a first side and a second side, the sheet of material being folded along its length in an accordion fold defining a plurality of flutes, the flutes having first and second legs opposing one another, defined by parallel material fold lines such that a width of the first legs is about equal to a width of the second legs;
an adhesive on at least one of each opposing first and second legs, wherein the sheet of material with the adhesive thereon is compressed to fold along the fold lines to form a flat compressed board, and wherein the flat compressed board is folded along at least one board fold line parallel to the material fold lines to form the rigid, shaped board structure.
2. The board structure of claim 1, wherein the sheet of material is a fibrous material.
3. The board structure of claim 2, wherein the fibrous material is paper.
4. The board structure of claim 1 wherein the board fold line is at an angle of 90°.
5. The board structure of claim 1 further including multiple board fold lines.
6. The board structure of claim 1 wherein the rigid shaped board defines first and second edges, the edges having a wrapping thereover.
7. The board structure of claim 1 further comprising a wrapping surrounding the board.
8. The board structure of claim 1 wherein the rigid, shaped board structure is formed from multiple sheets of material, at least two of the sheets of material being folded in an accordion fold.
9. A method for making a rigid board structure, the method comprising:
folding a sheet of material in an accordion fold to define a plurality of flutes, the flutes having first and second legs opposing one another forming parallel material fold lines such that a width of the first legs is about equal to a width of the second legs;
applying an adhesive to at least one of opposing first and second legs;
compressing the sheet of material with the adhesive thereon to fold along the material fold lines to form a flat compressed board; and
folding the flat compressed board along at least one board fold line, the board fold line being parallel to the material fold lines to form the rigid shaped board structure.
10. The method of claim 9 wherein in the material is a fibrous material.
11. The method of claim 10 wherein the fibrous material is paper.
12. The method of claim 9 wherein the board fold line is at an angle of 90°.
13. The method of claim 9 wherein the board is folded at multiple board fold lines parallel to the material fold lines to form the rigid shaped board structure.
14. The method of claim 9 wherein the rigid, shaped board structure defines first and second edges, the edges having a wrapping thereover.
15. The method of claim 9 wherein the folded, compressed board is wrapped in material.
16. The method of claim 9, wherein the folding a sheet of material is a first sheet of material and further including folding a second sheet of material along material fold lines.

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