

United States Patent

Garduna

[15] 3,692,201

[45] Sept. 19, 1972

[54] MODULAR CONTAINER PANEL

[72] Inventor: **Gerald G. Garduna**, 13691 Dawson St., Garden Grove, Calif. 92640

[22] Filed: **Sept. 23, 1970**

[21] Appl. No.: **74,753**

[52] U.S. Cl.**217/12, 217/65, 52/590**

[51] Int. Cl.**B65d 9/34, B65d 9/12**

[58] Field of Search**217/65, 12; 287/20.92; 46/31; 220/6; 52/108, 590**

[56] References Cited

UNITED STATES PATENTS

35,436	12/1901	Sierer	52/590
2,057,942	10/1936	Fay	217/65
2,844,232	7/1958	Leroy	217/65
1,952,817	3/1934	Neary	217/12 R

FOREIGN PATENTS OR APPLICATIONS

171,882	7/1952	Austria	52/590
---------	--------	---------------	--------

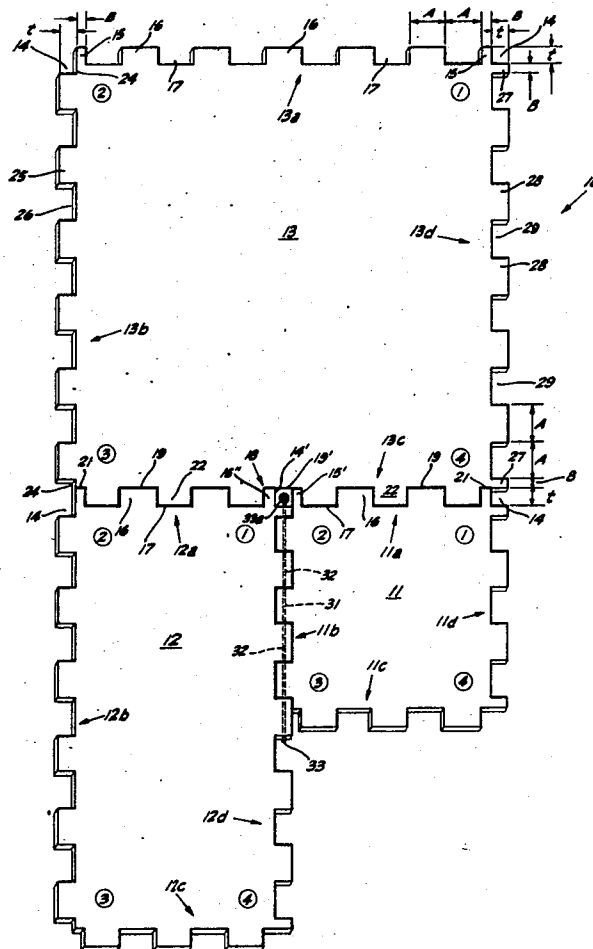
384,191	12/1932	Great Britain	46/31
666,117	2/1952	Great Britain	217/12 R

Primary Examiner—Raphael H. Schwartz
Attorney—Hinderstein

[57] ABSTRACT

Modular panels adapted for interdigitated assembly to form containers of selectable size and shape. Each panel comprises a generally rectangular sheet of material of thickness t , with a square notch of size t by t in each corner. Between the corners, along each edge of the panel, are an odd number of alternating recesses and projections each of depth t . Preferably, the width of the end recess or end projection adjacent each corner is B , the width of all other recesses or projections being $A = 2B + t$. A container may be assembled by inserting the projections of one panel within the recesses of one or more adjacent panels. Because of its unique configuration, any panel or combination of panels may be used interchangeably as top, bottom, side or end of the container.

14 Claims, 7 Drawing Figures



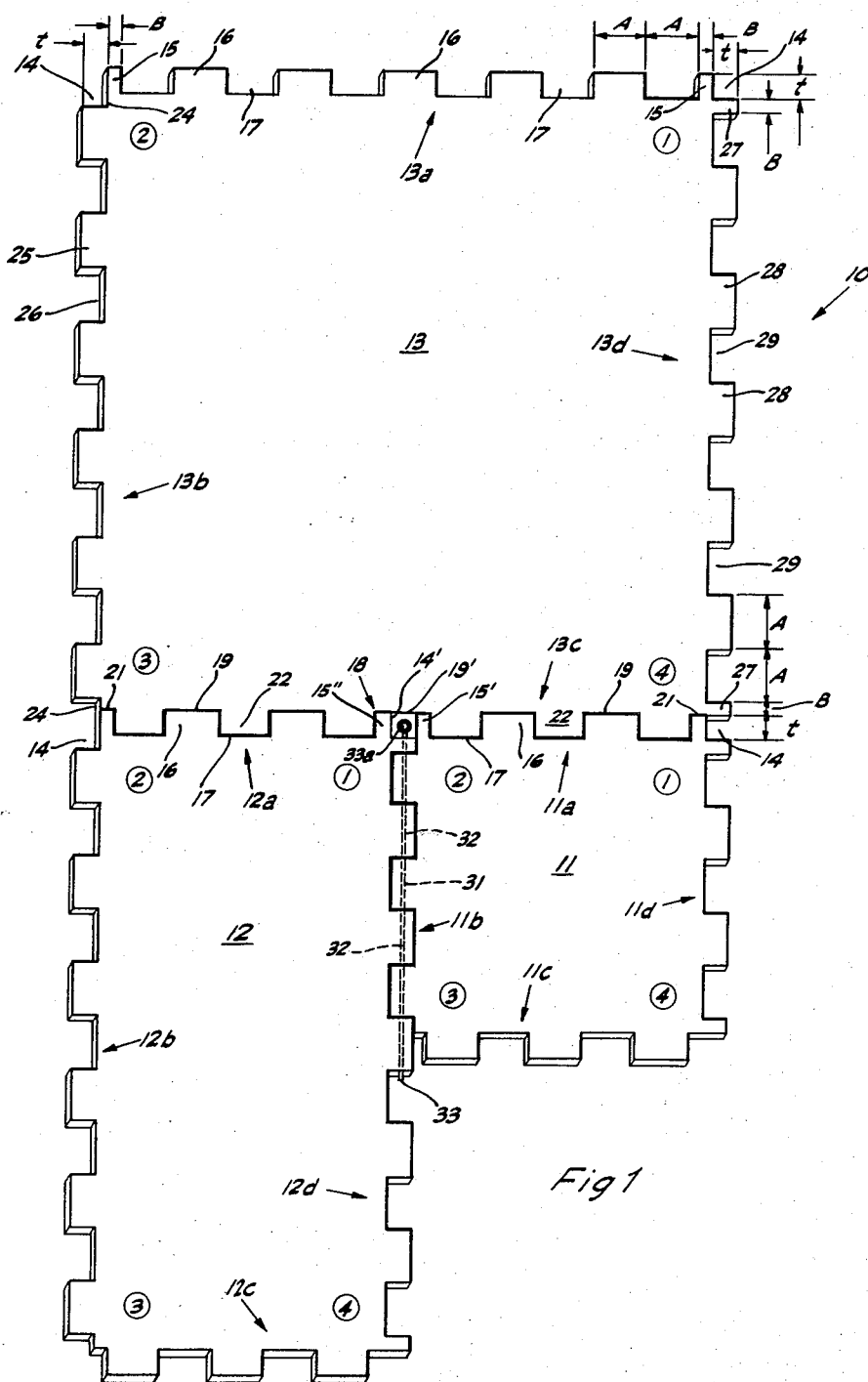


Fig 1

INVENTOR.

GERALD G. GARDUNA

BY

Hinderstein & Silber

ATTORNEYS

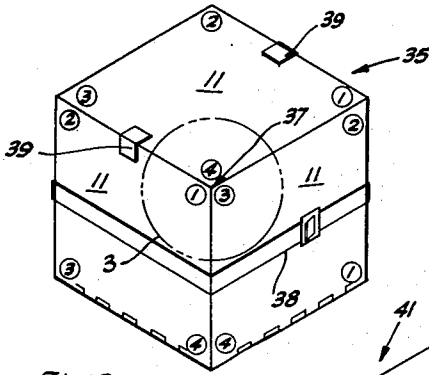


Fig 2

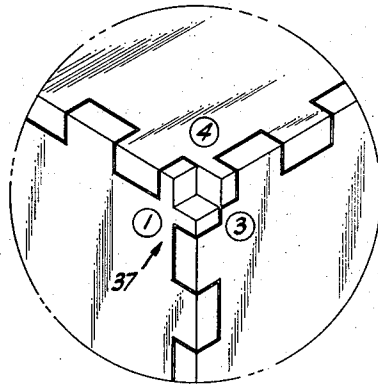


Fig 3

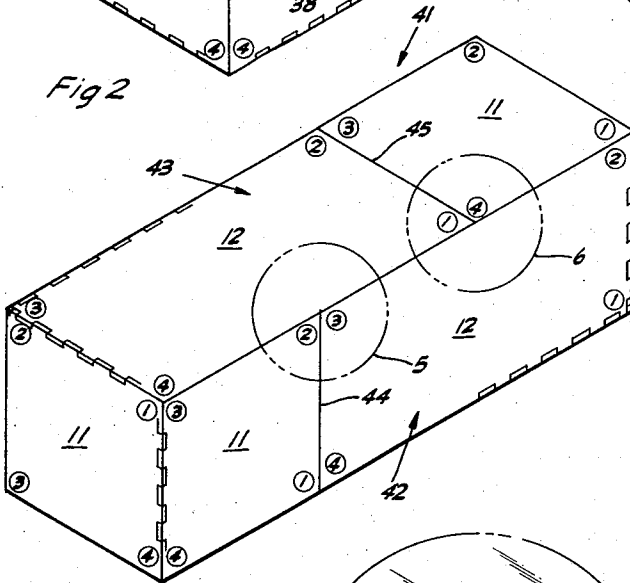


Fig 4

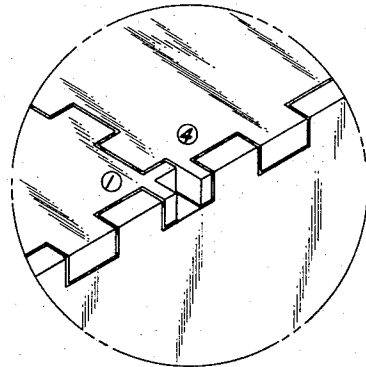


Fig 6

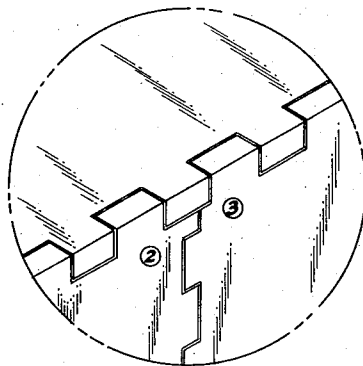


Fig 5

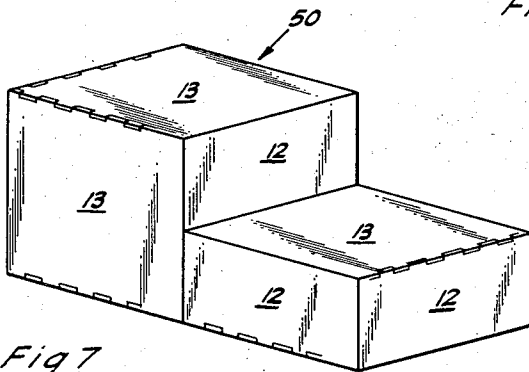


Fig 7

INVENTOR
GERALD G. GARDUNA
BY
Hinderstein & Silber
ATTORNEYS

MODULAR CONTAINER PANEL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a modular container panel, and more particularly to modular panels having crenelated edges configured for interdigitated assembly to form containers of selectable size and shape.

2. Description of the Prior Art

A problem often encountered by the shipping departments of manufacturers, distributors and warehouses is that of packaging items of unusual shape. The problem is particularly acute in facilities which ship many items, but only a few of each size or shape; such volume does not justify the purchase and storage of custom shaped containers for each item. Indeed, if the facility did store a large variety of packages, the container inventory cost would be excessive. As a result, the usual practice is to keep on hand a relatively small assortment of standard size containers, usually of rectangular solid shapes. Then, when an item of unusual shape is to be shipped, the container of next larger size is selected, and the item packaged in this container. While this approach reduces the number of containers which need to be stored, it results in wasted space during shipping, and may therefore result in increased shipping costs.

An alternative approach to the problem has been to use modular panels which may be assembled into a container of desired size. While various types of modular container panels are known in the prior art, all of these suffer shortcomings which prevent them from being assembled into packages of unusual shape or size.

Most prior art modular packaging panels are specifically configured for use as the side or top or end of a container, without being interchangeable therebetween. This approach is typified by the tenon and mortise-type assemblies shown for example in the U.S. Pats. to Burchard (No. 211,318), Baker (No. 282,483) and Rice (No. 776,942). In these assemblies, each panel is so configured that it must be used only as a side, only as an end, and so forth.

In the packing case shown in U.S. Pat. No. 1,952,817 to Neary, a panel including rectangular projections which fit into the dovetailed recesses of an adjacent panel is useful as top, bottom or side of a package. However, the end panels are substantially differently configured, having open ended, slotted projections along the edges, which hook onto like projections on the side panels. Further, the Neary panels cannot be connected in coplanar relationship to form, e.g., a side having overall dimensions greater than any individual panel.

While some prior art systems have suggested the idea of using panels of uniform configuration as either top, end or sides of a package, such systems also have had severe shortcomings. For example, the container framework shown in U.S. Pat. No. 2,960,249 to Walsh requires a tongued connector strip to attach the grooved edges of adjacent panels. Further, with such a system the interpanel seams on a side or end of the container are aligned with seams on the adjacent top, bottom or side. Such alignment of seams results in structural weakness of the container.

Another shortcoming typical of prior art modular container systems is that when like panels are assem-

bled in the same plane to form a container element larger in size than any individual panel, a gap is left between the adjacent panels. Such would be the case were modular container panels of the type shown in U.S. Pat. No. 3,093,259 to Morrison connected in coplanar array.

These and other limitations of the prior art are overcome using the present invention which comprises a set of modular panels of unique configuration permitting assembly of containers of a wide variety of size and shape from but a few standard size panels. The novel configuration permits each panel to be used interchangeably as a side, end, top or bottom of the container. Two or more of the panels may be assembled in the same plane to form a container element of size greater than, or shape different from that of any individual panel. When so combined, there is no requirement for a separate interlocking connecting strip, no gaps are left along the abutting edges, and the abutting panels themselves may be interlocked with one or more other panels without the requirement that all seams be aligned. As a result, panels of only a few different sizes need be stored to facilitate packaging and shipping of items of almost any size and shape. Moreover, the assembled containers need not be of simple rectangular solid shape, but may more closely conform to the shape of the item being packaged, thereby permitting economy in shipping costs as well as in inventory of containers. As a further benefit, the panels are reusable, and in fact may be used by the recipient of the container for his own shipping purposes.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a modular container panel adapted for interdigitated assembly with other like panels to form containers of selectable size and shape. To this end, each panel comprises a generally rectangular sheet of material of thickness t , with a square notch or void of size t by t at each corner thereof. Between the corners, along each edge of the panel, are an odd number of alternating recesses and projections each of depth t . Preferably, the width of the end recess or end projection adjacent each corner is B , and the width of each intermediate recess or projection is $A = 2B + t$.

Using panels of the preferred configuration just described, containers of selectable size and shape may be assembled by interdigitating the projections and recess of adjacent panels. When two such panels are attached, the projections of one panel completely fill the mating recesses of the adjacent panel, thereby insuring no gap or opening between the two panels. Moreover, a third panel may be attached to the two joined panels, without regard for alignment of seams.

Each panel may be used as side, end, top or bottom of a container, or as a part of one such container element. Uniform recess/projection spacing is maintained along an edge, even across a perpendicular seam between two coplanar panels.

Adjacent panels may be connected by appropriate means such as a pin extending through the interdigitating projections, a band around the container, or appropriate angle brackets or like hardware at the interfaces between panels.

Thus it is an object of the present invention to provide an improved modular container panel.

Another object of the present invention is to provide a modular panel having crenelated edges and adapted for interdigitated assembly into a container of selectable size and shape.

A further object of the present invention is to provide a modular panel of generally rectangular shape and thickness t , and characterized by a notch or void of size t by t in each corner, and an odd number of alternating projections and recesses along each panel edge between such voids, the end recess or projection adjacent each notch having width B , the width of all other recesses or projections being $A = 2B + t$.

BRIEF DESCRIPTION OF THE DRAWINGS

Still other objects, features, and attendant advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description of the preferred embodiments constructed in accordance therewith, taken in conjunction with the accompanying drawings wherein like numerals designate like parts in the several figures and wherein:

FIG. 1 is a perspective view of three modular container panels each in accordance with the present invention and assembled in coplanar relationship;

FIG. 2 is a perspective view of a cube-shaped container assembled of six identical panels each in accordance with the present invention;

FIG. 3 is a fragmentary isometric view of a typical apex of the container of FIG. 2;

FIG. 4 is a perspective view of a rectangular solid-shaped container assembled from panels in accordance with the present invention, and having an overall length greater than that of any individual panel used to form the container;

FIGS. 5 and 6 are fragmentary isometric views of interfaces between panels forming the assembled container of FIG. 4; and

FIG. 7 is a perspective view of a typical container of irregular shape which may be assembled using the inventive panels.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and particularly to FIG. 1 thereof, there is shown a coplanar assembly comprising three modular container panels 11, 12, 13 each in accordance with the present invention. Panels 11, 12 and 13, although different in overall size, all are characterized by a novel crenelated edge configuration permitting the panels to be interdigitated in the manner shown. For example, an edge 11a of panel 11 and an edge 12a of panel 12 both may engage an edge 13c of panel 13, while the edges 11b (panel 11) and 12d (panel 12) are interdigitated along an interface generally perpendicular to panel edge 13c. The edge configuration permitting such assembly, and the benefits to be derived therefrom, are described in detail below.

Referring more specifically to panel 13 (FIG. 1) as illustrative of the present invention, it may be seen that this panel includes four generally perpendicular edges 13a, 13b, 13c, and 13d. Preferably, panel 13 is planar and has a thickness t . A square notch or void 14 of length t and width t is present in each corner of panel 13. Between corner notches 14, along any edge of

panel 13, are an odd number of alternating recesses and projections. Thus, edge 13a includes a total of 13 recesses and projections including two end projections 15, five other projections 16 and six recesses 17. Preferably, end projections 15 are of equal width B , the value of which is a matter of design choice. The depth of each recess 17 preferably equals the thickness t of panel 13. Further, the width of each projection 16 and each recess 17 preferably is $A = 2B + t$.

The dimensions just described facilitate the type of three-panel interconnection shown generally at 18 in FIG. 1. In this regard, note that panel edges 11a and 12a are dimensioned and configured identically to edge 13a of panel 13 except for having fewer number of recesses 17 and projections 16. Thus the left-hand (as viewed in FIG. 1) end projection 15' of edge 11a and the right-hand end projection 15'' of edge 12a each is of width b , so that the overall width of end projections 15', 15'' and the common corner notch 14' therebetween is equal to $2B + t$, exactly the same as the width A of the recess 19' on edge 13c into which projections 15', 15'' extend.

Still referring to FIG. 1, note that panel edge 13c includes a pattern of alternating recesses and projections which is the inverse of edge 13a. Thus edge 13c includes end recesses 21, each of width B , immediately adjacent corner notches 14. Intermediate end recess 21 are five recesses 19, 19' and six projections 22 each of width $A = 2B + t$. Note that edges 11c and 12c are configured identically to edge 13c of panel 13, except for the number of intermediate projections and recesses.

Panel edge 13b (FIG. 1) includes end recesses 24, each of width B , intermediate which are an odd number of alternating projections 25 and recesses 26 each of width $A = 2B + t$. The pattern of projections and recesses along edge 13d is the inverse of that along edge 13b. Thus, edge 13d includes end projections 27, each of width B , intermediate which are projections 28 and recesses 29 each of width $A = 2B + t$. Again, note that the edges 11b and 12b are configured similarly to edge 13b of panel 13, and edges 11d and 12d are configured similarly to panel edge 13d.

Note in FIG. 1 that the four panel corners are of different configuration. For simplicity of description, the corner including end projections 15 and 27 herein is designated 1, the corner including end projection 15 and end recess 24 herein is designated 2, the corner including the end recesses 21 and 24 herein is designated 3, and the corner including recess 21 and projection 27 herein is designated 4. Typical panels 11, 12 and 13 all have been marked accordingly.

Although panels of three different sizes (but like configuration) are illustrated in FIG. 1, the invention is by no means so limited. Thus it may be desirable to provide generally square or rectangular panels having a greater or lesser (but always odd) number of alternating recesses or projections along the edges thereof. For example, another modular panel (not shown) may have a total of 11 projections and recesses along two opposite edges, and a total of 23 projections and recesses along the remaining two opposite edges. Such a panel would be equivalent in size to two panels 13 placed edge-to-edge, or to one panel 13 and two panels 12, or to one panel 12 and four panels 11 placed together in a plane.

Panels in accordance with the present invention may be constructed of plastic, wood, cardboard, fiber board, metal or like material. A particularly useful embodiment may be constructed of panels having a thickness $t = \frac{1}{8}$ inches. By selecting the dimension $B = \frac{21}{64}$ inches, the dimension A will equal 1 one thirty-second inches. With such typical values of A , B and t , panel 11 will have an "inside" (notch-to-notch) dimension of 5 thirteen-sixteenths inches along each edge, and panel 13 will have an "inside" dimension of exactly 12 inches. Panel 12 then will measure 5 thirteen-sixteenths $\times$ 12 inches. A square panel having a total of 23 alternating projections and recesses along one edge would have an "inside" dimension along that edge of $24 \frac{1}{8}$ inches, whereas a panel having a total of 35 alternating projections and recesses along one edge would have an "inside" dimension along that edge of $36 \frac{1}{8}$ inches. In this manner, any combination of panels of lesser size, when assembled in a plane, will be equal in size to a larger panel, as is evident in FIG. 1.

Referring again to FIG. 1, illustrative means by which two interdigitated panels 11, 12 may be connected is shown at the interface between edges 11b and 12d. In particular, each of the projections along edge 11b is provided with a hole 31 parallel to that edge. Similarly, each projection along edge 12d is provided with a hole 33 parallel to that edge. When edges 11b and 12d are interdigitated, holes 31 and 32 are aligned to permit the insertion therethrough of a pin 33. Pin 33 thus maintains panel 11 attached to panel 12. One end of pin 33 may include a ring 33a. Although not shown, another pin may be used to connect panel edge 13c to edges 11a and 12a. Such a pin thus could be inserted through ring 33a further to secure the interconnection.

FIGS. 2, 4 and 7 shown several of the almost limitless number of container configurations which can be achieved using modular panels in accordance with the present invention. Thus, a simple cube-shaped container 35 may be assembled from six square panels 11. A larger cube (not shown) could be assembled using six panels 13. The panel corner designations specified in FIG. 2 correspond to those used in FIG. 1. In this regard, notice that identical panels 11 may be used interchangeably for any side, top or bottom of cube 35.

The interdigitating relationship of the panels 11 forming a cube 35 is shown in detail in FIG. 3. Note therein that apex 37 occurs at the junction of a 1 corner of one panel 11, the 3 corner of another panel 11, and the 4 corner of a third panel 11.

Cube 35 may be held together using pins such as pin 33 shown in FIG. 1. Alternatively, cube 35 may be held together by a conventional packaging band or strap 38 or by the use of right angle brackets 39.

Additional features of the invention are evident in FIGS. 4, 5 and 6 wherein there is shown a rectangular-solid-shaped container 41 formed by using six panels 11 and four panels 12. Thus the side 42, top 43 and (hidden) bottom each employ a panel 11 in coplanar attachment with a panel 12. Note that there is no gap whatever between the coplanar panels 11, 12 forming side 42 or top 43. Moreover the unique panel edge configuration allows assembly of container 41 such that the side interpanel seam 44 is offset from the top interpanel seam 45 and is similarly spaced from the seam (hidden in FIG. 4) between the panels forming the bottom of

container 41. This results in considerably more structural rigidity than would be obtained were seams 44, 45 aligned.

It is important to note that the edge configuration of the inventive panels facilitate interdigitated assembly of top 43 to side 42 despite the offset in seams 44 and 45. This is illustrated in FIGS. 5 and 6, which respectively show the recesses and projection configuration at the interfaces of side 42 and top 43 adjacent seams 44 and 45. Note that the corners of each panel 11 and 12 employed at container 41 have been designated with numerals conforming to those used in FIG. 1. Note also in FIGS. 5 and 6 that since the thickness of each panel is equal to the depth of each recess, the projections from top 43 completely fill the recesses in the panels forming side 42.

FIG. 7 is included to indicate the versatility of the inventive modular panels for permitting assembly of a container of almost any shape or size. Thus, a plurality of panels of 12 and 13 readily may be assembled into the step-shaped container 50. In this regard, the bottom of container 50 (hidden in FIG. 7) may utilize two panels 13, or a single rectangular panel equal in size thereto.

Although not shown, in a different embodiment of the invention, a panel may include in the middle thereof a row of aperatures configured exactly to receive therein the edge projections of another panel. For example, such row may include end aperatures of width B and intermediate aperatures of width A , all of length t , adapted to receive projections 15, 16 or 27, 28 of a panel 11, 12 or 13. Such inserted panel would be perpendicular to the aperatured panel, and may, e.g., provide a partition within a container assembled from the inventive panels described above. Alternatively, a set of aligned projections (not shown) may extend upward from the middle of a panel to allow interdigitated connection thereto of the recesses along the edge of another, perpendicular panel.

While the invention has been described with respect to the preferred physical embodiments constructed in accordance therewith, it will be apparent to those skilled in the art that various modifications and improvements may be made without departing from the scope and spirit of the invention. Accordingly, it is to be understood that the invention is not to be limited by the specific illustrative embodiments, but only by the scope of the appended claims.

I claim:

1. A planar, generally rectangular modular panel characterized by a void in each corner, each void including a square area, each side of said square area being equal in length to the thickness of said panel, and a plurality of alternating recesses and projections along each panel edge between said areas, the total number of recesses and projections along each edge being odd, the projections or recesses adjacent each area being of a first width, all other projections and recesses being of a second width equal to twice said first width plus said thickness, the pattern of recesses and projections along one edge being the inverse of the pattern along the opposite edge.

2. A panel as defined in claim 1 wherein the depth of each recess equals said thickness.

7

3. A plurality of panels each as defined in claim 1, said panels being assembled by interdigitation of said recesses and projections into a structure of selectable shape.

4. A modular container panel comprising a generally rectangular, planar sheet of thickness t , having a notch in each corner, said notch including a square void of size t by t , an odd number of alternating recesses and projections along each edge between said voids, each recess along one edge being aligned with a projection of the same size along the opposite edge, the end recess or end projection adjacent each square void having a width B , all other recesses or projections having a width $A = 2B + t$.

5. A panel as defined in claim 4 wherein the depth of each recess is t .

6. A container formed of a plurality of panels each as defined in claim 5, projections from one panel being disposed within recesses of an adjacent panel.

7. A container as defined in claim 6 wherein one edge of a first panel engages the aligned edges of two adjacent panels, a recess of width A in said one edge receiving the end projections of width B of both said adjacent panels and the common notch of width t therebetween.

8. A container as defined in claim 6 including axially aligned holes through each of the projections along and parallel to at least one edge of said panels and a connecting pin extending through the aligned holes of the interdigitated projections.

8

9. A panel adapted for interdigitated assembly with one or more like panels, said panels being generally rectangular and having a notch in each corner, each notch comprising a square void, all four edges of said panel being crenelated by an odd number of alternating projections and recesses of like width except that the width of the end projection or end recess adjacent each void has a smaller width, said like width equaling the sum of the length of a corner void plus the combined width of two end projections or two end recesses.

10. A panel as defined in claim 9 wherein the length of each square void and the depth of each recess each equal the thickness of said panel.

11. At least two panels each as defined in claim 9, and connector means for maintaining said two or more panels in interdigitated relationship.

12. Interdigitated panels as defined in claim 11 wherein said connector means comprises a pin extending through axially aligned holes in the interdigitated projections of said panels.

13. Interdigitated panels as defined in claim 12 wherein said connector means comprises a strap or a bracket.

14. First and second panels each as defined in claim 9, said first panel further including a row of apertures or projections, along the middle thereof, adapted for interdigitated connection thereto of the edge projections or recesses of said second panel.

* * * * *

35

40

45

50

55

60

65