Aug. 5, 1952 M. I. WILLIAMSON 2,605,953

HOLLOW-WALLED BOX

Filed June 19, 1951 3 Sheets-Sheet 1

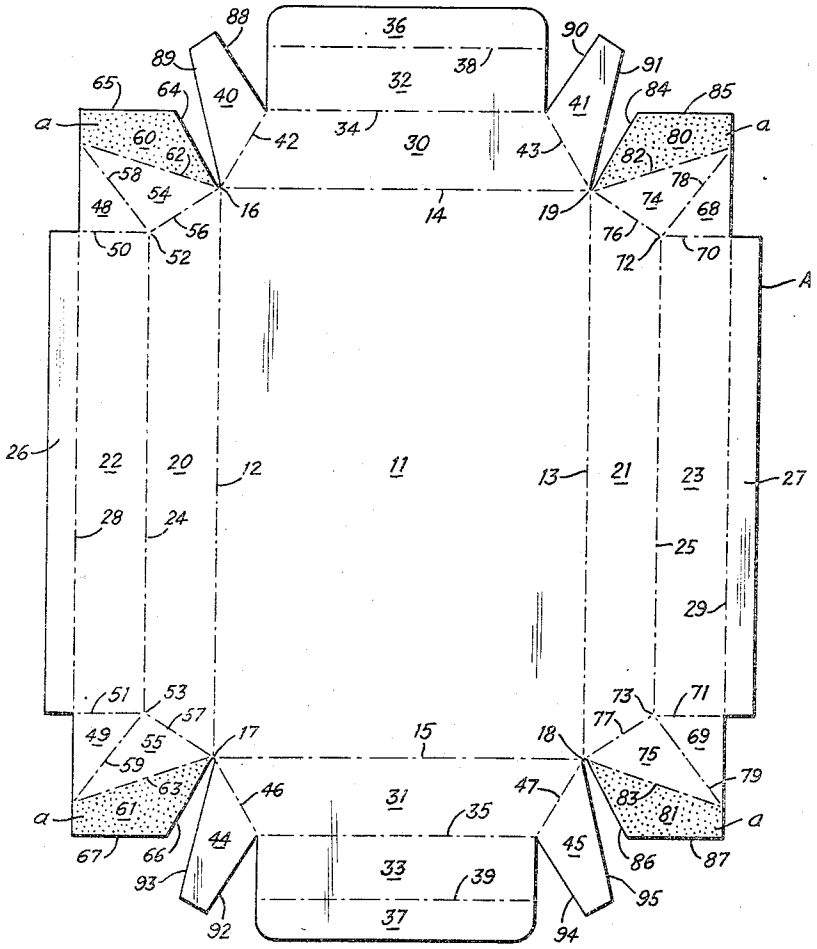


Fig. 1

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Filed June 19, 1951 3 Sheets-Sheet 2

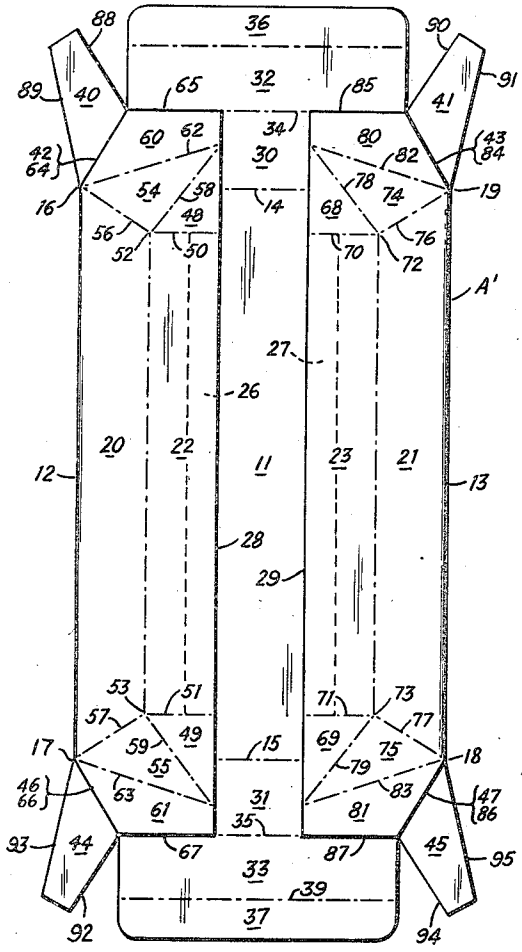


Fig. 2

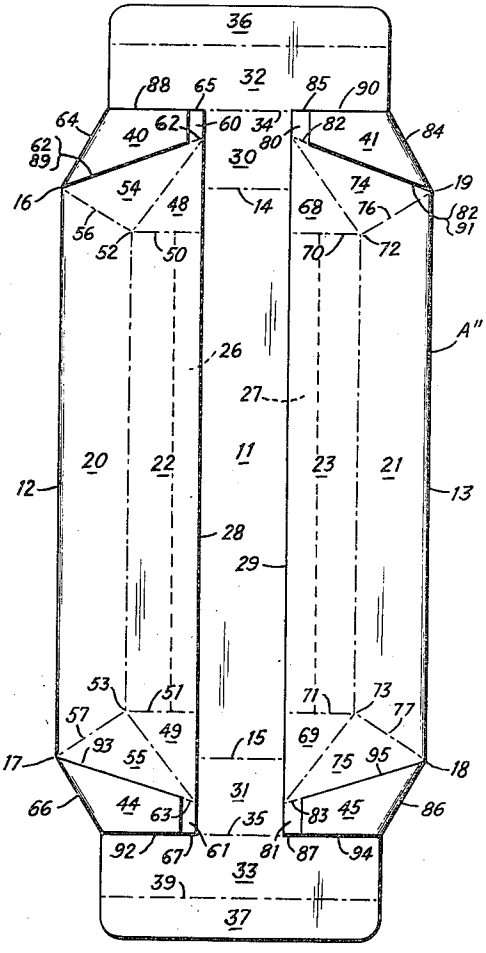


Fig. 3

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HOLLOW-WALLED BOX

Filed June 19, 1951 3 Sheets-Sheet 3

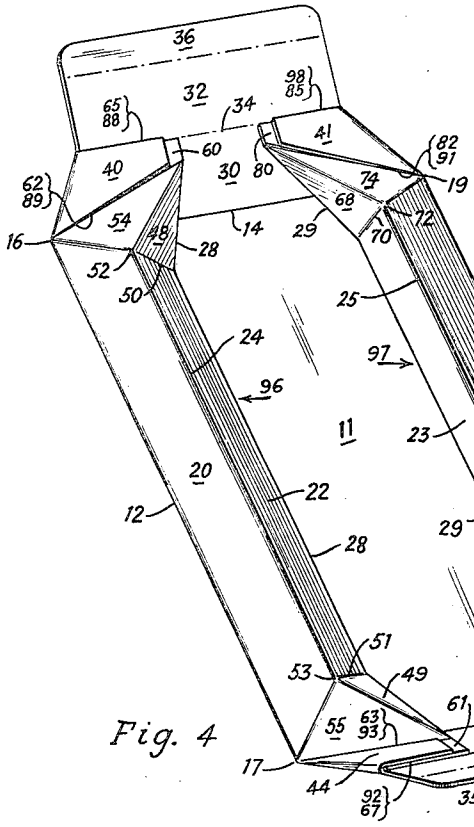


Fig. 4

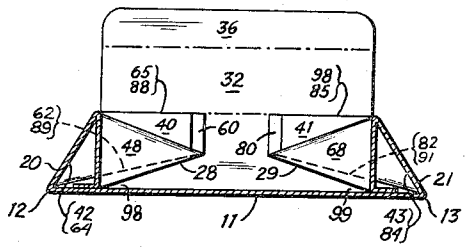


Fig. 6

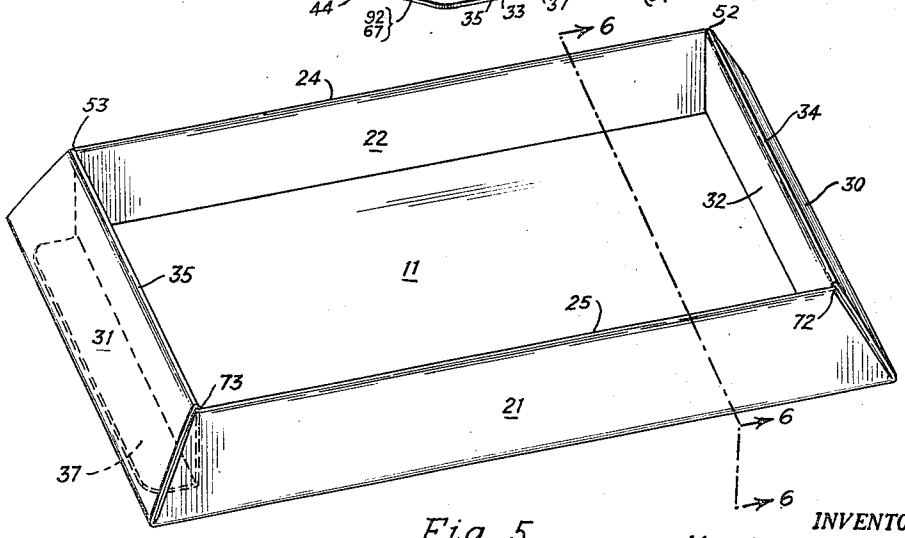


Fig. 5

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Patented Aug. 5, 1952

2,605,953

UNITED STATES PATENT OFFICE

2,605,953

HOLLOW-WALLED BOX

Marshall I. Williamson, New Haven, Conn.

Application June 19, 1951, Serial No. 232,349

7 Claims. (Cl. 229—34)

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This invention provides a novel and improved construction for boxes, cartons, trays, or other receptacles made from paperboard, cardboard, or other foldable sheet material, hereinafter collectively referred to for convenience as "boxes" or "folding boxes."

This invention has particular reference to folding boxes having hollow walls of substantially triangular cross-section. Such boxes are sometimes referred to as "bevel-edge" boxes or "bevel-edge" trays.

Hollow walled boxes of the aforementioned type must meet exacting specifications with regard to appearance and strength. The most important structural detail in this connection is the construction of the box corners since it determines not only the neatness of appearance, but also the resistance of the box to deformation. It is very important that hollow walled boxes should have corner constructions which remain neatly assembled even if considerable force is exerted on the hollow box walls from the inside, from the outside, or from above.

Forces from the inside are generally exerted by the merchandise packaged in the box. Tight fitting merchandise, for example, exerts quite a substantial force against the inner panels of the box walls.

Forces from the outside are encountered if the box is tight-wrapped, or packaged in multiple in larger boxes or cases.

Forces from above are encountered when the boxes are stacked one on top of another.

My prior Patent 2,522,325 of September 12, 1950 discloses and claims, among other details, a particularly advantageous and strong corner construction for hollow walled folding boxes having walls of substantially triangular cross-section. This corner construction includes a plurality of panels integral with the inner panel and with the outer panel of a hollow wall, for example, a side wall, the characteristic feature of the arrangement being, that the panel assembly which originally forms a continuation of the hollow side wall can be folded to extend in a new direction, at an angle to the direction it originally assumed, to furnish support for a further box wall, for example, an end wall, which extends at an angle to the side wall.

This invention is concerned with certain improvements and refinements of the aforementioned basic corner construction. The invention provides wall constructions covering a considerable range of angles for the inside and for the outside wall panels, and also permits box

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blanks to be pre-folded and pre-glued in such a way that the assembly of the box, beginning from a flat collapsed blank, is greatly facilitated.

These improvements are the subject matter of this and of a co-pending application for Letters Patent, Serial No. 232,350, filed June 19, 1951. This application for Letters Patent is more particularly directed to hollow walled folding boxes of the aforementioned type in which the main, or bottom, panel is of single ply thickness. It is also directed to the feature of pregluing certain portions of the blank in such a way that erection of two opposite wall structures automatically causes the other two wall structures to assume their final shape and position.

My co-pending application, Serial No. 232,350 is directed to boxes in which the main panel, or bottom, is of double thickness. In the latter type of box all exposed surfaces of the box are formed by the same surface of the board permitting use of board which is imprinted, decoratively finished, or otherwise surface treated on one side only.

Regardless whether a single-ply bottom construction or a double-ply bottom construction is used, there is a large choice of angles. The inside wall panels, as well as the outside wall panels, may have a slope of 60 degrees with respect to the main panel. The inside walls may form an angle of 90 degrees with respect to the main panel and the outside walls may slope at an angle of 45 degrees or 60 degrees, as may be required by the particular packaging job. The boxes may be shallow or they may be deep. The angles of the side walls may differ from the angles of the end walls, and the angles in general, may be of other magnitudes than hereinbefore stated, the previously given figures being most commonly called for in the trade.

These and various other objects, features and advantages of the invention will appear more fully from the detailed description which follows, accompanied by drawings showing, for the purpose of illustration, a representative embodiment of the invention. The invention also consists in certain new and original features of construction and combination of elements hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages, and the manner in which it may be carried out, may be better understood by re-

ferring to the following description taken in connection with the accompanying drawing in which:

Figure 1 is a plan view of a flat cut and scored box blank incorporating the present invention;

Figure 2 shows the blank of Figure 1 after a first compound folding operation which may be accompanied by a gluing operation, gluing being optional;

Figure 3 is a plan view of the blank of Figure 2 after a further folding operation, resulting in a flat collapsed structure ready for expansion into hollow box form;

Figure 4 is a perspective view of the blank of Figure 3 in the process of expansion into hollow box form;

Figure 5 is a perspective view of the completed box; and

Figure 6 is an end view, partly in section, of the box of Figure 5, a section being taken on plane 6—6—6 of Figure 5, the inner end wall being shown upright, before folding and tucking in.

In the following description and in the claims, various details will be identified by specific names for convenience. These names, however, are intended to be as generic in their application as the art will permit. Corresponding reference characters refer to corresponding parts in the several figures of the drawings.

In the drawings accompanying, and forming part of, this specification, certain specific disclosure of the invention is made for the purpose of explanation of broader aspects of the invention, but it is understood that details may be modified in various respects without departure from the principles of the invention and that the invention may be applied to other structures than the one shown.

Referring to the drawings, the blank A in Figure 1 may be cut and scored in multiple from rolls or sheets of paperboard, cardboard, or other flexible sheet material. Only one side of the board need be imprinted or otherwise decoratively finished, since only one side of the blank is exposed to view, except for the inner bottom surface. In Figure 1 the blank is shown in the position in which the unfinished surface faces the observer.

The blank is subdivided into panels and flaps by a plurality of score lines. A main panel 11 is bordered by outer side fold lines 12 and 13 and outer end fold lines 14 and 15. These fold lines intersect at the corners 16, 17, 18 and 19 of the main panel which, as will later be seen, become the outer corners of the box.

Outer side wall panels 20 and 21 are articulated to the main panel 11 along the outer side fold lines 12 and 13, respectively. Inner side wall panels 22 and 23 are articulated to the outer side wall panels along side ridge fold lines 24 and 25. Inner bottom flaps 26 and 27 are articulated to the inner side wall panels 22 and 23 along inner side fold lines 28 and 29, respectively.

In a similar manner outer end wall panels 30 and 31 are articulated to the main panel 11 along the outer end fold lines 14 and 15, respectively. Inner end wall panels 32 and 33 are articulated to the outer end wall panels along end ridge fold lines 34 and 35, respectively. Tuck flaps 36 and 37 are articulated to the inner end wall panels 32 and 33 along inner end fold lines 38 and 39, respectively.

A pair of side flaps 40 and 41 are articulated

to the outer end wall panel 30 along oblique flap fold lines 42 and 43 extending at an angle with respect to the outer end fold line 14. A further pair of side flaps 44 and 45 is articulated to the outer end wall panel 31 along oblique flap fold lines 46 and 47, respectively.

The provision of the side flaps 40, 41, 44 and 45 is optional. However, as will later become apparent, the side flaps, besides performing a structural function, result in neater appearance, since no cut edges are exposed at the corners of the box if the aforementioned side flaps are employed.

The corner structure of the blank includes at least two panel portions bordered by at least three corner fold lines aimed at a common point of intersection on the side ridge fold lines. In the illustrated form of blank substantially triangular panel portions 48 and 49 are articulated to the inner side wall panel 22 along corner fold lines 50 and 51, respectively. These fold lines intersect the side ridge fold line 24 at 52 and 53. A further pair of substantially triangular panel portions 54 and 55 is articulated to the outer side wall panel 20 along corner fold lines 56 and 57, respectively. It will be noted that these corner fold lines 56 and 57 are also aimed at the points of intersection 52 and 53, respectively. The panel portions 54 and 55 are further bordered by corner fold lines 58 and 59 towards the panel portions 48 and 49, respectively. The corner fold lines 58 and 59 are also aimed at the points 52 and 53, respectively.

Securing flaps 60 and 61 are articulated to the panel portions 54 and 55 along flap fold lines 62 and 63, respectively. These securing flaps perform their function in a variety of ways, as will later be seen. They may be adhesively secured to other portions of the blank or they may be caused to abut one or more fold lines of the blank with their outer edges, such abutment edges being 64 and 65 on the securing flap 60, and edges 66 and 67 on the securing flap 61.

In a similar manner substantially triangular panel portions 68 and 69 are articulated to the inner side wall panel 21 along corner fold lines 70 and 71, respectively. These fold lines intersect the side ridge fold lines 25 at 72 and 73, respectively. A further pair of substantially triangular panel portions 74 and 75 is articulated to the outer side wall panel 21 along corner fold lines 76 and 77, respectively. It will be noted that these corner fold lines 76 and 77 are also aimed at the points of intersection 72 and 73, respectively. The panel portions 74 and 75 are further bordered by corner fold lines 78 and 79 towards the panel portions 68 and 69, respectively. The corner fold lines 78 and 79 are also aimed at the points 72 and 73, respectively.

Securing flaps 80 and 81 are articulated to the panel portions 74 and 75 along flap fold lines 82 and 83, respectively. These securing flaps 80 and 81 have abutment edges 84, 85, and 86, 87, respectively.

The side flaps 40, 41, 44, and 45 have cut bordering edges 88, 89, 90, 91, 92, 93, 94 and 95, respectively, which are so disposed that the cut edges abut certain fold lines of other panels in the assembled box.

For the purpose of more convenient assembly, it may be desirable to form certain lines of articulation as interrupted cut scores rather than plain scores to reduce the resistance of the board to folding. Such cut scores are indicated in the drawings by dash double-dot lines and are found,

for example, at 50, 51, 70, 71, at 62, 63, and at 82, 83.

The assembly of the blank A shown in Figure 1 into box form may proceed as follows:

In the event the securing flaps are to be adhesively secured, adhesive *a* is first applied to the securing flaps 60, 61, 80 and 81. However, as previously indicated, the gluing of these flaps is optional and there is no material difference in strength or rigidity of the finished box, whether the securing flaps are glued or not. However, gluing of the securing flaps facilitates the erection of the boxes as will later become apparent.

As a first folding operation, the inner bottom flaps 26 and 27 are folded upon the inner side wall panels 22 and 23 along the inner side fold lines 28 and 29, respectively.

The side wall assemblies are then folded over the inside surface of the main panel 11 along the outer side fold lines 12 and 13, respectively. The aforedescribed folding operations produce what is called in the art a "compound fold" and bring the securing flaps 60, 61, 80 and 81 into overlying position with respect to the outer end wall panels 30 and 31. If adhesive is employed, the securing flaps 60 and 80 are adhesively secured to the outer end wall panel 30, and the securing flaps 61 and 81 are adhesively secured to the outer end wall panel 31.

Even if no adhesive is employed, it becomes apparent that in the folded condition the abutment edges 64 and 84 are in substantial registry with the flap fold lines 42 and 43. Similarly, the abutment edges 66 and 86 are in substantial registry with the flap fold lines 46 and 47. Also, the abutment edges 65 and 85 are in substantial registry with the end ridge fold line 34 and the abutment edges 68 and 87 are in substantial registry with end ridge fold line 35.

Figure 2 illustrates the box blank in folded condition, the blank being designated as A'.

Next, the side flaps 40, 41, 44 and 45 are folded over the respective securing flaps 60, 80, 61, and 81, respectively. After performance of this last described folding operation, the blank has the appearance as shown in Figure 3, the condition of the blank being designated as A''. It will be noted that the abutment edges 88 and 90 of the side flaps 40 and 41 lie in substantial coincidence with the abutment edges 65 and 85, and also with the end ridge fold line 34. The abutment edges 89 and 91 are in substantial coincidence with the corner fold lines 62 and 82.

At the other end of the box, the abutment edges 92 and 94 of the side flaps 44 and 45 are in substantial coincidence with the abutment edges 67 and 86 and with the end ridge fold line 35. The abutment edges 93 and 95 of the side flaps 44 and 45 are in substantial coincidence with the corner fold lines 63 and 83, respectively.

The blank A'' may be shipped and stored in flat collapsed condition and requires a minimum of space for shipping and storing. It may easily be set up into hollow box form by a simple operation which is illustrated in Figure 4 and which will now be described.

In order to erect the box, the end wall assemblies are folded at the fold lines 14 and 15 with respect to the main panel 11. This folding operation causes the side walls to assume hollow triangular cross-sectional shape, the edges 28 and 29 receding towards the side edges 12 and 13 of the box. The movement of the edges 28 and 29 is indicated by the arrows 96 and 97 and is a result of the folding of the triangular panel portions at the box corners. It is seen that the blank creases at the fold lines 62, 82, 63 and 83, as well as at the corner fold lines 50, 51, 70 and 71, respectively. In order to reduce the resistance of the board to folding at these fold lines, the board is interruptedly cut-scored, as hereinbefore mentioned.

The points of inter-section 52, 53, 72 and 73 rise as peaks and form four ridge corners. The panel portions 54, 55, 74 and 75 form end surfaces over which the outer end wall panels 30 and 31 are foldable and against which the end panels rest together with the flaps 40, 60, 41, 80 and the flaps 44, 61, and 45, 81, which are folded over the outer end wall panel 30 and 31, respectively.

When the folding of the outer end wall panels 30 and 31 is completed, the end ridge fold lines 34 and 35 extend between the peaks 52, 72 and 53, 73, respectively.

In order to complete the setting up of the box it is only necessary to fold the inner end wall panels 32 and 33 into their required position with respect to the main panel 11, and to tuck the tuck flaps 36 and 37 into the interior space of the hollow end wall structures thus formed. The tuck flaps have a frictional engagement, points 98 and 99 being such points of frictional engagement for the flap 36 in Figure 6.

The resulting box is of extraordinary strength and is greatly resistant to forces exerted on it from the inside, from the outside and from above. The box has also extraordinary resistance to twisting. The strength of the box is due mainly to the unique corner construction formed by the aforementioned panel portions having bordering fold lines aimed at common points of intersections. The strength of the corner assembly, particularly its resistance to outwardly directed force, is enhanced by the aforementioned abutment between the various abutment edges and the fold lines with which the abutment edges lie in registry.

It is a particular feature of the hereinbefore described box form that the securing flaps 60, 80, 61, and 81 may be preglued, thus facilitating the erection of the box.

If the securing flaps are not glued, the strength of the box is hardly affected. However, the erection of the box may require a slight outward pressure in the direction of the arrows 96 and 97 against the edges 28 and 29 in order to cause the side walls to assume hollow triangular shape. The strength of the unglued box is practically equal to the strength of the glued box since the edge-to-fold line abutment between the various cut edges and fold lines at each corner imparts a great amount of strength and rigidity to the box corners.

Obviously the present invention is not restricted to the particular form of box herein described, but may be incorporated in other forms of boxes with equal benefits. Thus, various additions, omissions, modifications, substitutions, and other changes may be made without departing from the spirit of the invention.

What is claimed is:

1. A hollow-walled folding box comprising, a bottom panel; side wall structures, and at least one end wall structure articulated to said bottom panel, each of said side wall structures comprising, an outer side wall panel articulated to said bottom panel along an outer side fold line, an inner side wall panel articulated to said outer side wall panel along a side ridge fold line, and an inner bottom portion articulated to said inner

side wall panel along an inner side fold line; said end wall structure comprising, an outer end wall panel articulated to said bottom panel along an outer end fold line, an inner end panel articulated to said outer end panel along an end ridge fold line, and a flap articulated to said inner end panel along an inner end fold line; a corner structure comprising at least two panel portions bordered by at least three corner fold lines aimed at a common point of intersection on said side ridge fold line, one of said corner fold lines articulating one of said panel portions to said outside wall panel, another of said corner fold lines articulating another of said panel portions to said inside wall panel, a third corner fold line articulating one panel portion to another panel portion, said one corner fold line forming an angle of less than 180 degrees with said other corner fold line, the apex of the angle being said common point which by reason of this angularity lies inwardly of the box with respect to the imaginary extension of the outer end fold line; and a flap articulated to said one panel portion, said flap underlying said outer end wall panel in box assembled position in which said flap is also folded back upon said one panel portion.

2. A hollow-walled folding box comprising, a bottom panel; side wall structures, and at least one end wall structure articulated to said bottom panel, each of said side wall structures comprising, an outer side wall panel articulated to said bottom panel along an outer side fold line, an inner side wall panel articulated to said outer side wall panel along a side ridge fold line and an inner bottom flap articulated to said inner side wall panel along an inner side fold line; said end wall structure comprising, an outer end wall panel articulated to said bottom panel along an outer end fold line, an inner end panel articulated to said outer end panel along an end ridge fold line, and an end flap articulated to said inner end panel along an inner end fold line; a corner structure comprising at least two panel portions bordered by at least three corner fold lines aimed at a common point of intersection on said side ridge fold line, one of said corner fold lines articulating one of said panel portions to said outside wall panel, another of said corner fold lines articulating another of said panel portions to said inside wall panel, a third corner fold line articulating one panel portion to another panel portion, said one corner fold line forming an angle of less than 180 degrees with said other corner fold line, the apex of the angle being said common point which by reason of this angularity lies inwardly of the box with respect to the imaginary extension of the outer end fold line; and a securing flap articulated to said one panel portion along a flap fold line, said flap fold line being aimed at the adjacent bottom panel corner, the securing flap being adhesively secured to the inside surface of the outer end wall panel, thereby strengthening the side wall structure against outward pressure and causing the side walls automatically to assume set up position when the end wall panels are folded.

3. A hollow-walled folding box comprising, a bottom panel; side wall structures, and at least one end wall structure articulated to said bottom panel, each of said side wall structures comprising, an outer side wall panel articulated to said bottom panel along an outer side fold line, an inner side wall panel articulated to said outer side wall panel along a side ridge fold line and an inner bottom flap articulated to said inner side wall panel along an inner side fold line; said end wall structure comprising, an outer end wall panel articulated to said bottom panel along an outer end fold line, an inner end panel articulated to said outer end panel along an end ridge fold line, and an end flap articulated to said inner end panel along an inner end fold line; a corner structure comprising at least two panel portions bordered by at least three corner fold lines aimed at a common point of intersection on said side ridge fold line, one of said corner fold lines articulating one of said panel portions to said outside wall panel, another of said corner fold lines articulating another of said panel portions to said inside wall panel, a third corner fold line articulating one panel portion to another panel portion, said one corner fold line forming an angle of less than 180 degrees with said other corner fold line, the apex of the angle being said common point which by reason of this angularity lies inwardly of the box with respect to the imaginary extension of the outer end fold lines; and a securing flap articulated to said one panel portion along a flap fold line, said flap fold line being aimed at the adjacent bottom panel corner, the said securing flap having an end edge abutting said end ridge fold line in box assembled position in which said securing flap is folded back with respect to said one panel portion, thereby reinforcing the box corner against outwardly directed force acting on the walls.

4. A hollow-walled folding box comprising, a bottom panel; side wall structures, and at least one end wall structure articulated to said bottom panel, each of said side wall structures comprising, an outer side wall panel articulated to said bottom panel along an outer side fold line, an inner side wall panel articulated to said outer side wall panel along a side ridge fold line and an inner bottom flap articulated to said inner side wall panel along an inner side fold line; said end wall structure comprising, an outer end wall panel articulated to said bottom panel along an outer end fold line, an inner end panel articulated to said outer end panel along an end ridge fold line, and an end flap articulated to said inner end panel along an inner end fold line; a corner structure comprising at least two panel portions bordered by at least three corner fold lines aimed at a common point of intersection on said side ridge fold line, one of said corner fold lines articulating one of said panel portions to said outside wall panel, another of said corner fold lines articulating another of said panel portions to said inside wall panel, a third corner fold line articulating one panel portion to another panel portion, said one corner fold line forming an angle of less than 180 degrees with said other corner fold line, the apex of the angle being said common point which by reason of this angularity lies inwardly of the box with respect to the imaginary extension of the outer end fold line; a securing flap articulated to said one panel portion along a flap fold line, said flap fold line being aimed at the adjacent bottom panel corner; and a side flap articulated to the outer end wall panel along a fold line also aimed at said bottom panel corner, and oblique with respect to said outer end fold line.

5. A hollow-walled folding box comprising, a bottom panel; side wall structures, and at least one end wall structure articulated to said bottom panel, each of said side wall structures comprising, an outer side wall panel articulated to said bottom panel along an outer side fold line, an

inner side wall panel articulated to said outer side wall panel along a side ridge fold line and an inner bottom flap articulated to said inner side wall panel along an inner side fold line; said end wall structure comprising, an outer end wall panel articulated to said bottom panel along an outer end fold line, an inner end panel articulated to said outer end panel along an end ridge fold line, and an end flap articulated to said inner end panel along an inner end fold line; a corner structure comprising at least two panel portions bordered by at least three corner fold lines aimed at a common point of intersection on said side ridge fold line, one of said corner fold lines articulating one of said panel portions to said outside wall panel, another of said corner fold lines articulating another of said panel portions to said inside wall panel, a third corner fold line articulating one panel portion to another panel portion; a securing flap articulated to said one panel portion along a flap fold line, said flap fold line being aimed at the adjacent bottom panel corner; and a side flap articulated to the outer end wall panel along a fold line also aimed at said bottom panel corner, and oblique with respect to said outer end fold line, said securing flap having a side edge abutting said side flap fold line in box assembled position in which said securing flap is folded back with respect to said one panel portion.

6. A hollow-walled folding box comprising, a bottom panel; side wall structures, and at least one end wall structure articulated to said bottom panel, each of said side wall structures comprising, an outer side wall panel articulated to said bottom panel along an outer side fold line, an inner side wall panel articulated to said outer side wall panel along a side ridge fold line and an inner bottom flap articulated to said inner side wall panel along an inner side fold line; said end wall structure comprising, an outer end wall panel articulated to said bottom panel along an outer end fold line, an inner end panel articulated to said outer end panel along an end ridge fold line, and an end flap articulated to said inner end panel along an inner end fold line; a corner structure comprising at least two panel portions bordered by at least three corner fold lines aimed at a common point of intersection on said side ridge fold line, one of said corner fold lines articulating one of said panel portions to said outside wall panel, another of said corner fold lines articulating another of said panel portions to said inside wall panel, a third corner fold line articulating one panel portion to another panel portion, said one corner fold line forming an angle of less than 180 degrees with said other corner fold line, the apex of the angle being said common point which by reason of this angularity lies inwardly of the box with respect to the imaginary extension of the outer end fold line; a securing flap articulated to said one panel portion along a flap fold line, said flap fold line being aimed at the adjacent bottom panel corner; and a side flap articulated to the outer end wall panel along a fold line also aimed at said bottom panel corner, and oblique with respect to said outer end fold line said securing flap being adhesively secured to the inside surface of the outer end wall panel.

7. A hollow-walled folding box comprising, a bottom panel; side wall structures, and at least one end wall structure articulated to said bottom panel, each of said side wall structures comprising, an outer side wall panel articulated to said bottom panel along an outer side fold line, an inner side wall panel articulated to said outer side wall panel along a side ridge fold line and an inner bottom flap articulated to said inner side wall panel along an inner side fold line; said end wall structure comprising, an outer end wall panel articulated to said bottom panel along an outer end fold line, an inner end panel articulated to said outer end panel along an end ridge fold line, and an end flap articulated to said inner end panel along an inner end fold line; a corner structure comprising at least two panel portions bordered by at least three corner fold lines aimed at a common point of intersection on said side ridge fold line, one of said corner fold lines articulating one of said panel portions to said outside wall panel, another of said corner fold lines articulating another of said panel portions to said inside wall panel, a third corner fold line articulating one panel portion to another panel portion, said one corner fold line forming an angle of less than 180 degrees with said other corner fold line, the apex of the angle being said common point which by reason of this angularity lies inwardly of the box with respect to the imaginary extension of the outer end fold line; a securing flap articulated to said one panel portion along a flap fold line, said flap fold line being aimed at the adjacent bottom panel corner; and a side flap articulated to the outer end wall panel along a fold line also aimed at said bottom panel corner, and oblique with respect to said outer end fold line, said side flap having an edge also aimed at said bottom panel corner, said edge being in substantial coincidence with the flap fold line of said securing flap when said side flap rests between said securing flap and said one panel portion in box assembled position.

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