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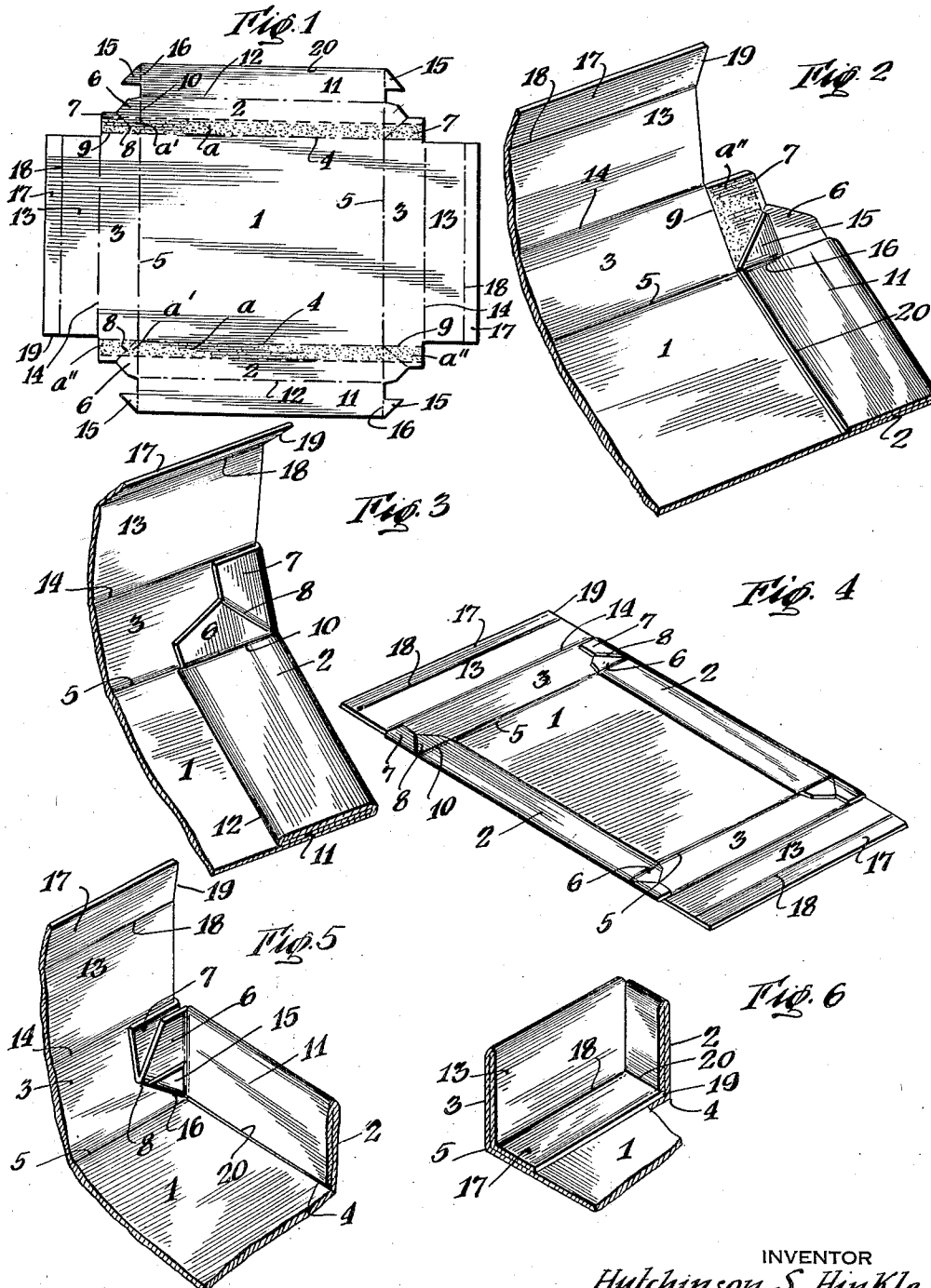
H. S. HINKLE

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METHOD OF MAKING COLLAPSIBLE BOXES

Filed June 28, 1937

2 Sheets-Sheet 1



INVENTOR
Hutchinson S. Hinkle
BY
Albert M. Austin
ATTORNEY

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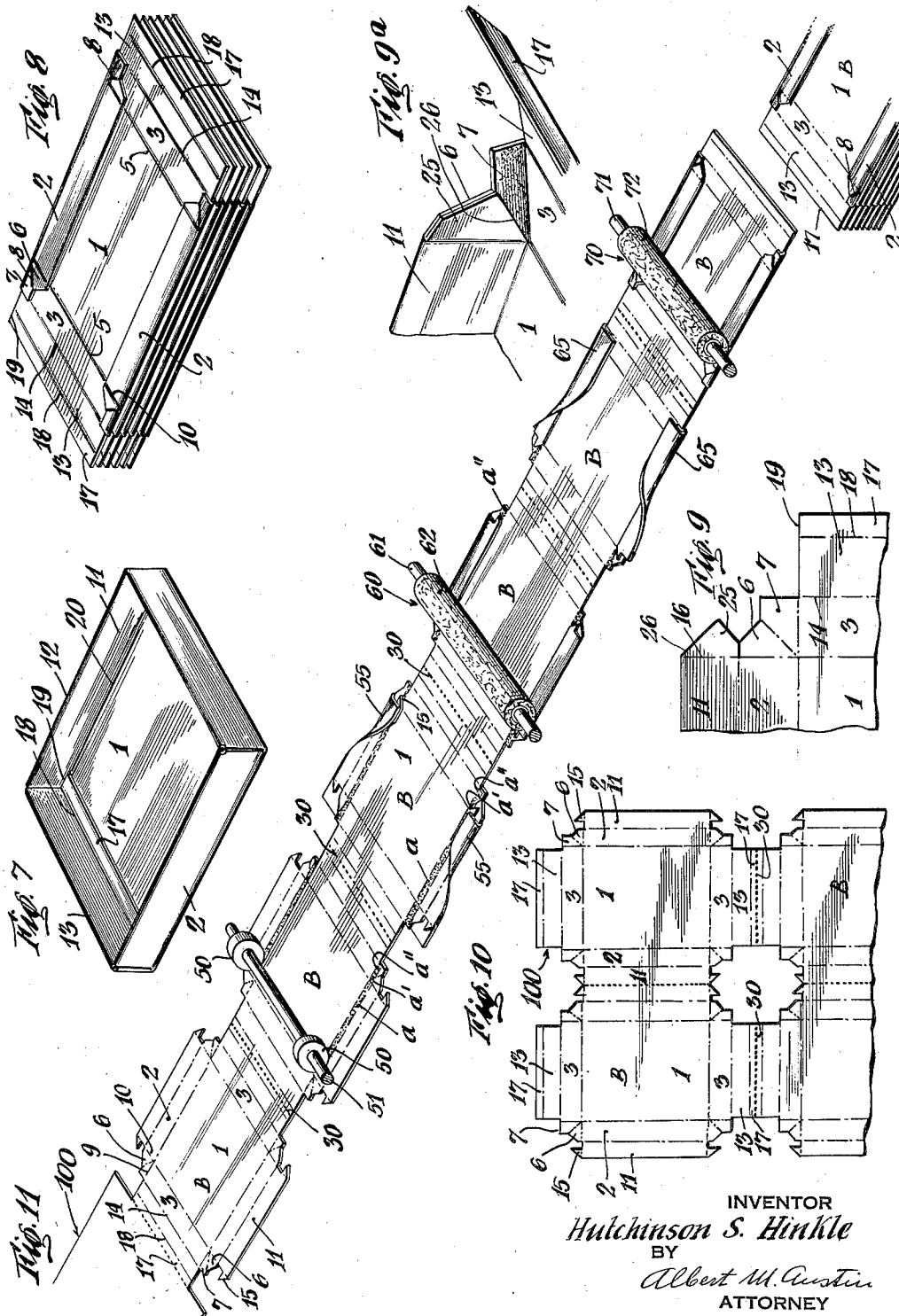
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INVENTOR
Hutchinson S. Hinkle

BY

Albert M. Austin
ATTORNEY

UNITED STATES PATENT OFFICE

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METHOD OF MAKING COLLAPSIBLE BOXES

Hutchinson S. Hinkle, Bethany, Conn., assignor
to National Folding Box Company, New Haven,
Conn., a corporation of New Jersey

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10 Claims. (Cl. 93-49)

This invention relates to method of making collapsible boxes, and more particularly to an improved method of making collapsible boxes which can be economically executed entirely by automatic machinery without hand operation.

In accordance with this invention, each box is made from a single blank of paperboard material which may be cut and scored from large sheets or rolls of paperboard material on an automatic cutting and scoring machine. The box as constructed is provided with double ply side and end walls, the double ply side walls being formed by providing flaps which fold inwardly and are secured by adhesive previously applied to the inside face of adjacent side wall portions of the blank. The box blank is provided with tabs which extend from each end of each side wall flap, each performing the dual function of first covering a corner section of the box to which adhesive has been applied and which if left exposed would cause the infolded section to adhere to the adjacent end wall of the box which should not adhere, and, second, of reinforcing the corners of the box.

An important feature of this invention comprises the application of substantially continuous straightline strips of glue which are applied along each side edge of the blank in such a manner that in succeeding folding operations only the desired portions of the blank will become adhered to selected other portions of the blank.

The straightline strip of the adhesive may be applied by a strip gluer, operating automatically at a very high rate of speed, making unnecessary any spot gluing operation which is comparatively slow, tedious, expensive and uncertain.

Another feature of this invention resides in folding and pressing the side wall flaps and associated tabs into adhesive contact with the inside face of the side wall portions and adjacent corner sections of the blank, respectively, which step can be performed automatically and in a single continuous operation.

A further feature of the invention resides in folding the side wall portions over the inside face of the bottom wall of the blank and the corner sections on the adjacent end walls, and thereafter pressing the corner sections which are hinged to the end walls into adhesive contact with adjacent end walls of the blank, producing a box which leaves the machine in collapsed position and ready for shipment to the user.

The blank is so shaped and constructed as to require only a limited number of assembly operations, all of which can be formed automatically

at a high rate of speed with a minimum amount of supervision and attention. Heretofore, the manufacture of collapsible boxes has required comparatively numerous time-consuming and complicated hand and machine operations which greatly add to the cost of the box to the consumer. These economies in manufacture are largely effected by organizing the steps of the process so as to permit the performance of only a single strip gluing operation to cover all portions of the blank which require adhesive coverage, the adhesive strips being so organized with respect to the blank as to further permit speedy and simple machine-performed operations to assemble the blank into collapsed box form. These economies can be effected without sacrificing strength, rigidity, erection speed, usefulness, or neatness, and in fact a collapsible box can thus be made which possesses these desirable characteristics to a greater degree than collapsible boxes heretofore produced.

Other objects or features and advantages of operation, arrangement and combination of steps in the process will become apparent from the following particular description and accompanying drawings.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which:

Fig. 1 is a plan view of the extended blank which has theretofore been cut and scored and the adhesive strips applied;

Fig. 2 is an enlarged fragmentary perspective view of the blank as it appears after the completion of a further step in the process wherein the side flaps and associated tabs have been infolded over the side wall portions and corner portions respectively of the blank.

Fig. 3 is an enlarged fragmentary perspective view of the blank as it appears after the completion of a further step in the process wherein the side wall portions have been infolded over the bottom wall portion and the corner portions have been infolded over the end walls;

Fig. 4 is a perspective view of the blank as it appears after the completion of the assembly operation wherein the box is presented in collapsible condition ready for shipment or storage;

Fig. 5 is an enlarged fragmentary perspective

view of the box in the process of being erected from its collapsed position, an operation which is performed by the user when the box is needed;

Fig. 6 is an enlarged fragmentary perspective view of the collapsible box as it appears when fully erected, this view showing particularly the means used for retaining the box in fixed erected position;

Fig. 7 is a perspective view of the box as it appears when fully assembled;

Fig. 8 is a perspective view of a plurality of collapsible boxes as they appear when arranged in superimposed, stacked relationship, which stacking operation can be performed as the collapsed box emerges from the assembly machine;

Fig. 9 is a fragmentary plan view of an extended blank from which a collapsible box may be made by my process having tabs of somewhat modified form extending from the ends of the side wall portions;

Fig. 9a is a fragmentary perspective view of the modified form of a box in half-folded condition;

Fig. 10 is a plan view of a fragmentary section of a sheet or continuous roll of paperboard material as it appears after the cutting and scoring operation has been performed thereon; and

Fig. 11 is a diagrammatic perspective view illustrating the various steps performed on the successive blanks in the process of making the collapsible boxes.

Similar reference characters refer to similar parts throughout the specification and the several views of the drawings.

In accordance with this invention, a large sheet or roll of paperboard material 100 is run through a cutting and scoring machine which cuts out from the sheet a series of separate blanks B, each of which is to form an individual collapsible box. In this operation each blank is also suitably scored to permit proper folding of the parts of the blank into box form, and at the same time cuts each blank into the desired shape and size. When this operation has been performed the sheet or roll of paperboard material 100 will appear as shown in Fig. 10.

When formed, each blank as shown in Fig. 1 comprises a bottom wall portion 1 of generally rectangular form having side wall portions 2 and end wall portions 3 hinged thereto along the score lines 4 and 5 respectively. The adjacent ends of the side and end wall portions are each connected together by a corner portion, each corner portion being divided by a diagonally extending score line 6 into a generally triangular-shaped section 6 hinged to the end of the side wall portion 2 along the score line 10, and a generally triangular-shaped section 7 hinged to the adjacent end wall 3 along the score line 9. The score lines 9 may form substantially a continuation of the adjacent score lines 4 and the score lines 10 may likewise form substantial continuations of the adjacent score lines 5. Each corner portion, comprising sections 6 and 7 hinged together along a diagonally extending score line 8, so that thereafter these sections may be folded to form bellows folds which will lie against the inside face of the adjacent end wall 3 when the box is set up.

A side wall flap 11 is hinged to each of the side wall portions 2 along a score line 12, and each flap 11 is substantially the same length as the adjacent side wall portion 2 to which it is hinged. A tab 15 is hinged along the score line 15 to each end of each side wall flap. In assembling the

box the side wall flaps are turned inwardly so as to overlie the inside face of the adjacent side wall portion 2 and each tab 15 extending therefrom is so shaped as to overlie only the section 6 of the corner portion which is hinged to the adjacent end of the side wall portion 2 and does not extend beyond the diagonally extending score line 8 traversing the adjacent corner portion.

An end wall flap 13 is hinged to each end wall portion 3 along a score line 14 and, when the box is erected, is folded inwardly against the inside face of the end wall portion. Each end wall flap 13 is slightly shorter in width than the width of the adjacent end wall portion 3 so as to permit the same to be infolded without bulging outwardly the side walls of the box. Suitable means may be provided to retain the end wall flaps 13 in fixed infolded position and thus to retain the box in erect merchandise-containing position. For the purpose of illustration only I have shown a foot portion 17 hinged to each end wall flap 13 along the score line 16. When the box is erected the foot portion 17 is adapted to lie against the inside face of the bottom wall 1 with the projecting end portions 18 thereof seating under the lower edge 20 of the adjacent intumed side wall flaps 11.

As illustrated in Fig. 11, the blanks B may be completely severed from one another or they may be weakly connected together by a line of perforations 30, so as to provide a line or web of connected blanks. Fig. 11 illustrates the successive steps or operations performed upon the individual blanks to effect assembly thereof into collapsible boxes. The box assembly operation as illustrated in Fig. 11 may, if desired, form a direct continuation of the cutting and scoring operation performed upon the rolls or sheets of paperboard material illustrated in Fig. 10. The blanks, either separate or joined through the agency of a line of perforations, are moved along a conveyor and successively into operative contact with glue-applying mechanism, folding mechanism and pressure mechanism.

The first operation performed upon the cut and scored blank is the application of a continuous strip of glue or adhesive along each side edge of the blank. These strips of glue may be applied by means of spaced glue rollers 50 mounted upon a shaft 51 positioned above the conveyor upon which the blanks are supported. A suitable fountain for the glue or adhesive operates to apply a film of the adhesive to the outer periphery of the rollers 50. The conveyor is so adjusted as to carry each blank into contact with the rollers 50 whereby the film of adhesive applied thereto is transferred in substantially straight continuous lines to the side edges of the blanks. The adhesive rollers 50 are of such width and are so spaced as to apply the desired strip of adhesive in a substantially continuous straight line across the inside face of each side wall portion 2 and the adjacent bellows fold-forming sections 6 and 7. As shown in Figs. 1 and 11, the strip of adhesive which traverses the inside face of the side wall portion 2 has been designated a for reason of description, that portion of the continuous strip which traverses the bellows fold section 6 has been designated a', and that portion of the continuous strip which traverses the bellows fold section 7 has been designated a''. The adhesive-applying rollers 50 or other applicators may be so designed as to apply spaced straightline strips of adhesive, comprising the adhesive portions a, a' and a''. If desired, the

adhesive strip may cover substantially the full height or width of the side wall portions 2 and the adjacent corner portions 6 and 7, or, if desired, the continuous straightline strip of adhesive may be considerably narrower, as indicated in Fig. 1.

Due to the fact that the strips of adhesive are so arranged that they may run in a substantially straight line, the glue strips can be automatically applied as by pressure rollers 50, shown in Fig. 11, or by brushes or other applicators which operate to rapidly apply glue strips to the successive blanks B as they are moved into contact therewith by the traveling conveyor.

Heretofore, in the manufacture of collapsible boxes the adhesive has been applied as a separate operation by a spot-gluing machine, which is tedious and time-consuming. My improved process permits the manufacture of collapsible boxes more economically and at a higher rate of speed than has heretofore been accomplished.

After the glue strips have been applied, the successive blanks B move into contact with infolding mechanism or plates 55 positioned along each side edge of the blank, which plates operate to substantially simultaneously fold the side wall flaps 11 over the inside face of the adjacent side wall portions 2 and the same operation folds the tabs 15 over the adjacent sections 6 of the corner portions.

Pressure is then applied to the traveling blank as by the roller 60, illustrated in Fig. 11, whereby the side wall flaps 11 are pressed into adhesive contact with adhesive *a* applied to the adjacent side wall portions 2 and the tabs 15 are also pressed into adhesive contact with adhesive *a'* applied to the inside face of the adjacent corner portion 6. The pressure roller 60 is preferably mounted upon a suitable shaft 61 which rotates in suitable stationary bearings (not shown). The roller 60 is preferably covered with a layer of resilient material 62, such as soft rubber, so that the roller will apply substantially uniform pressure to all portions of the side wall flaps 11 and corner sections 6. This uniform pressure may be further effected by mounting the shaft 61 in bearings which are adapted to ride vertically in opposition to springs or other means, applying a predetermined downward pressure thereto. The traveling conveyor is so adjusted as to transport the successive blanks B into pressure contact with the roller 60.

It will be noted that tabs 15 are provided which should be of sufficient area to completely cover that portion *a'* of the adhesive strip which traverses the corner section 6 so that when the tabs 15 are positioned thereover, no adhesive on the corner portions 6 will be exposed. Further, the outer margin 21 of the tabs when infolded over the corner sections 6 do not project beyond the diagonally extending score line 8 or difficulty will be encountered in assembling the box. The tabs 15, however, may be of such size as to substantially cover the adjacent corner sections 6.

I have shown in Fig. 9 a blank similar to the blank shown in Fig. 1 except that the tabs 25 which extend from each end of each side wall portion 2 are of such size as to substantially completely cover the corner sections 6, but whose outer edge 26 does not extend beyond the diagonal score line 8. The tabs 15 or 25 should not extend beyond the score line 8 or possess a substantially larger area than is sufficient to cover the corner section 6, but the tabs 15 or 25 should each be of sufficient size to cover and conceal that por-

tion *a'* of the glue strip which traverses the adjacent corner section 6.

When the side wall flaps 11 and the tabs 15 have been infolded into adhesive contact with the inside face of the side wall portions 2 and corner sections 6 respectively, the blank continues along the conveyor and into contact with further infolding mechanism or plates 65 positioned along each side of the blank. The plates 65 operate to fold the side wall portions 2 over the inside face of the bottom wall portion 1 of the blank and the corner sections 7 over the inside face of the adjacent end wall portions 3 of the blank, as the blanks are transported by the conveyor into contact with the turn-in plates 65.

Pressure means, such as a roller 70, then operates to press the corner sections 7 carrying the portion *a''* of the glue strip into adhesive contact with the inside face of the adjacent end wall portions, producing a folded blank as indicated in Figs. 3 and 4. The pressure roller 70 may be mounted on a shaft 71 which rotates in suitable bearings which may be mounted to ride vertically against the action of spring means applying a predetermined pressure thereto. The pressure roller 70 could also have a resilient covering 72 so that a substantially uniform pressure will be applied to the blank and particularly so that the corner sections 7 will be firmly adhesively secured to the inside face of the end walls 3. The folded blanks may then be separated, if necessary, along the line of perforations 30 and then stacked in superimposed relationship, as illustrated in Figs. 8 and 11, in which condition they are shipped to the user. The collapsible boxes thus assembled present no exposed glue areas if the box has been properly made and thus can be stacked in superimposed relationship without danger that the assembled blanks will adhere together.

In erecting the collapsed box the user folds the end walls 3 into upright position, which operation causes the side walls 2 to automatically spring into upright box-forming position, as illustrated in Fig. 5. In this position the triangular corner sections 7 will remain adhesively adhered to the inside face of the adjacent end walls 3, the tabs 15 will remain adhesively adhered to the adjacent corner sections 6 and the side wall flaps 11 will remain adhesively adhered to the inside face of the side walls 2. In the next operation the user folds the end wall flaps 13 inwardly so as to overlie the inside face of the end walls 2 and the outside face of the tabs 15. The third erecting operation comprises the pressing of the foot portions 17 downwardly against the inside face of the bottom wall 1, causing the projecting end portions 19 of the foot portions 17 to snap beneath the lower edge 20 of the side wall flaps, thus to securely lock the inturned end wall flaps 13 in fixed position and maintain the box in rigid erect position. The box is thus erected and ready to receive the merchandise.

In following my improved method of assembly, collapsible boxes can be rapidly and economically assembled entirely by machine operation and at low cost, providing boxes which emerge from the assembly operation in the collapsed form desired for economical shipment and storage.

Only four automatic machine-performed operations are required to completely assemble the box in collapsed form, which operations are: First, cutting and scoring the box-forming blanks from large sheets or continuous strips of paperboard material; second, applying a substantially con-

tinuous straightline strip of adhesive along the inside face of each of the two side edges of the blanks; third, folding and pressing the side wall flaps and tabs projecting therefrom into adhesive contact with the inside face of the side wall portions and the adjacent corner sections respectively of the blank; and, finally, folding the side wall portions and corner portions over the bottom wall portion and the adjacent end wall portions respectively of the blank and substantially simultaneously pressing the corner portions into adhesive contact with the adjacent end wall portions of the blank. Each folded blank thus forms a collapsed box, and the collapsed boxes may be conveniently stacked in superimposed relationship, occupying a minimum of space during shipment and storage.

The box can be quickly erected into merchandise-containing position by the user, which requires only three simple operations which are: First, raising the end walls 3 of the box into vertical position; second, folding the end wall flaps inwardly against the inside face of the adjacent end walls of the box; and, third, pressing the foot portions associated with the end wall flaps against the inside face of the bottom wall of the box, causing the end portions thereof to snap into interlocking engagement with the lower edge of the intumed side wall flaps.

The box as thus erected has a smooth and attractive exterior and interior appearance, and as thus constructed the side and end walls of the box are of double ply paperboard and are free from irregularities and projections. If desired, the side wall flaps 11 and the end wall flaps 13 need not extend down to the bottom wall 1 of the box, in which event the continuous straightline strips of adhesive should be moved outwardly a corresponding distance from the score lines 4 and 9, so that the glued areas on the side wall portions 2 and the corner sections 6 are completely covered by the intumed side wall flaps 11 and the tabs 15 respectively.

It is understood that the word "box" as herein used is intended to apply to either the merchandise-containing member of the box or the cover member which telescopes over the merchandise-containing member. As thus constructed, the blanks as illustrated in Figs. 1 and 10 may be used to form either member.

While certain novel features of the invention have been disclosed and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a method for assembling a collapsible paperboard box formed from a paperboard blank having a bottom wall panel, side and end wall panels with flaps extending from said side wall panels, corner portions hinged to and connecting said side and end wall panels, and tabs extending from the ends of said side wall flaps, the steps which include, applying a strip of adhesive in a substantially continuous straight line of substantially uniform width along the inside face of each of said side wall panels and the adjacent corner portions, folding said side flaps over said side wall panels, folding said side wall panels over the inside face of said bottom wall panels, and pressing the corner portions into adhesive contact with the end wall panels which they overlie.

2. In a method for manufacturing collapsible

paperboard boxes formed from a paperboard blank having a bottom wall panel, a side wall panel and an end wall panel, with a flap extending from said side wall panel, a corner portion having a score line extending diagonally there-through defining bellows sections hinged to and connecting the adjacent ends of said side and end wall panels, and tabs extending from the ends of said side wall flap, the steps which include, applying a strip of adhesive in a substantially continuous straight line along the inside face of said side wall panel and the adjacent corner portion, folding said side flap over said side wall panel and said tab over the adjacent corner portion in a single operation, folding said side wall panel over the inside face of said bottom wall, and pressing the corner portion into adhesive contact with the end wall panel which it overlies.

3. In a method for manufacturing collapsible paperboard boxes formed from a paperboard blank having a bottom wall panel, a side wall panel, and an end wall panel with a flap extending from said side wall panel, a corner portion having a score line extending diagonally there-through defining bellows sections hinged to and connecting the adjacent side and end wall panels, and tabs extending from the ends of said side wall flap, the steps which include, applying a strip of adhesive in a substantially continuous straight line of substantially uniform width along the inside face of said side wall panel and the adjacent corner portion, folding said side flap over said side wall panel and said tab over that section of the corner portion which is hinged to the side wall panel in substantially one operation, pressing said side flap and said tab into adhesive contact with said side wall panel and the adjacent bellows section respectively, folding said side wall panel over the inside face of said bottom wall and said section of the corner portion which is hinged to the end wall over the inside face of said end wall, and pressing said corner section into adhesive contact with the end wall which it overlies.

4. In a method for manufacturing collapsible paperboard boxes formed from a paperboard blank having a bottom wall panel, opposed side and end wall panels with flaps extending from each of said side wall panels, corner portions each having a score line extending diagonally there-through defining bellows sections hinged to and connecting the adjacent side and end wall panels, and tabs extending from the ends of each of said side wall flaps, the steps which include, applying a substantially continuous strip of adhesive along the inside face of each of said side wall panels and the adjacent corner portions in a single operation, folding said side wall flaps over the adjacent side wall panels and said tabs over the adjacent sections of the corner portions which are hinged to the adjacent side wall panels, pressing said flaps and said tabs into adhesive contact with the adjacent side wall panels and the adjacent bellows sections respectively, folding said side wall panels over the inside face of said bottom wall and said sections of the corner portions which are hinged to the end walls over the inside face of the adjacent end walls, and pressing said corner sections into adhesive contact with the end wall panels which they overlie.

5. In a method for manufacturing collapsible paperboard boxes formed from a paperboard blank having a bottom wall panel, opposed side and end wall panels with flaps extending from each of said side wall panels, corner portions

each having a score line extending diagonally therethrough defining bellows sections hinged to and connecting the adjacent side and end wall panels, and tabs extending from the end of each of said side wall flaps, the steps which include, simultaneously running a substantially continuous strip of adhesive along each side edge of the blank from one end of the blank to the other, each strip of adhesive traversing the inside face of a side wall panel and the adjacent corner portions, substantially simultaneously folding said side wall flaps over the adjacent side wall panels and said tabs over the adjacent sections of the corner portions which are hinged to the adjacent side wall panels, substantially simultaneously pressing said flaps and said tabs into adhesive contact with the adjacent side wall panels and the adjacent bellows fold sections respectively, substantially simultaneously folding said side wall panels over the inside face of said bottom wall and said sections of the corner portions which are hinged to the end walls over the inside face of the adjacent end walls, and substantially simultaneously pressing said corner sections into adhesive contact with the end walls which they overlie.

6. In a method for manufacturing collapsible paperboard boxes formed from a paperboard blank having a bottom wall, opposed side and end wall panels with flaps extending from each of said side wall panels, corner portions each having a score line extending diagonally therethrough defining bellows sections hinged to and connecting the adjacent side and end wall panels, and tabs extending from the end of each of said side wall flaps whose margins do not extend beyond those bellows sections which are hinged to adjacent side wall panels and defined by the adjacent diagonal score line, the steps which include, applying a substantially continuous straight line strip of adhesive along the inside face of each of said side wall panels and the adjacent corner portions, folding said side wall flaps into adhesive contact with the adjacent side wall panels and said tabs into adhesive contact with only the adjacent sections of the corner portions which are hinged to the adjacent side wall panels, and folding the corner sections which are hinged to the end wall panels into adhesive contact with the end wall panels which they overlie.

7. The method of manufacturing collapsible boxes which includes, cutting and scoring a continuous strip of paperboard material so as to provide separate paperboard blanks each having a bottom wall panel, opposed side and end wall panels with flaps extending from each of said side wall panels, corner portions hinged to and connecting said side and end wall panels, and tabs extending from the ends of said side wall flaps, thereafter applying a continuous strip of adhesive of substantially uniform width along each side edge of the blank from one end of the blank to the other, each strip of adhesive traversing the inside face of a side wall panel and the adjacent corner portions, folding said side flaps into adhesive contact with said side wall panels and folding said corner portions into adhesive contact with the adjacent end wall panels which they overlie.

8. The method of manufacturing collapsible boxes which includes, cutting and scoring a con-

tinuous strip of paperboard material so as to provide a series of paperboard blanks each having a bottom wall panel, opposed side and end wall panels with flaps extending from each of said side wall panels, corner portions hinged to and connecting said side and end wall panels and tabs extending from the ends of said side wall flaps, thereafter applying a substantially continuous straight line strip of adhesive of substantially uniform width along the side edges of each blank from one end of the blank to the other, so that each strip of adhesive traverses the inside face of a side wall panel and the adjacent corner portions, folding the side flaps of each blank into adhesive contact with the adjacent side wall panels, and folding said corner portions into adhesive contact with the adjacent end wall panels which they overlie.

9. The method of manufacturing collapsible boxes which includes, cutting and scoring a continuous strip of paperboard material so as to provide separate paperboard blanks each having a bottom wall panel, opposed side and end wall panels with flaps extending from each of said side wall panels, corner portions hinged to and connecting said side and end wall panels, and tabs extending from the ends of said side wall flaps, and thereafter successively treating said blanks by applying a substantially continuous straightline strip of adhesive along the side edges of each blank from one end of the blank to the other so that each strip of adhesive traverses the inside face of one side wall panel and the adjacent corner portions, folding substantially simultaneously the side flaps and tabs of each successive blank into adhesive contact with the side wall panels and the adjacent corner portions respectively, folding said corner portions into adhesive contact with the adjacent end wall panels which they overlie, and stacking said folded blanks in superimposed relationship.

10. The method of manufacturing collapsible boxes which includes, cutting and scoring a continuous strip of paperboard material so as to form separate paperboard blanks each having a bottom wall panel, opposed side and end wall panels with flaps extending from each of said side wall panels, corner portions each having a score line extending diagonally therethrough defining bellows sections hinged to and connecting the adjacent side and end wall panels, and tabs extending from the ends of each of said side wall flaps, thereafter applying to each of said blanks a substantially continuous strip of adhesive along the inside face of each of said side wall panels and the adjacent corner portions, folding said side wall flaps over the adjacent side wall panels and said tabs over the adjacent sections of the corner portions which are hinged to the adjacent side wall panels, pressing said flaps and said tabs into adhesive contact with the adjacent side wall panels and the adjacent bellows fold sections respectively, folding said side wall panels over the inside face of said bottom wall and said sections of the corner portions which are hinged to the end walls over the inside face of the adjacent end walls, and pressing said corner sections into adhesive contact with the end wall panels which they overlie.

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