April 18, 1961 H. V. BOLDING 2,980,308

METHOD OF MANUFACTURE OF BOX AND STRUCTURE THEREOF

Filed March 8, 1957 2 Sheets-Sheet 1

FIG. 1.

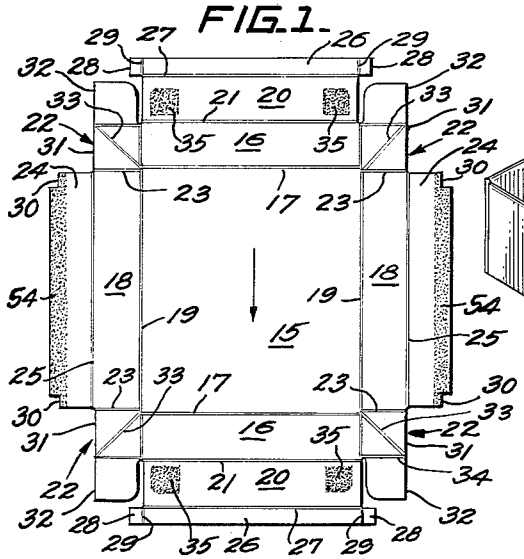


FIG. 6.

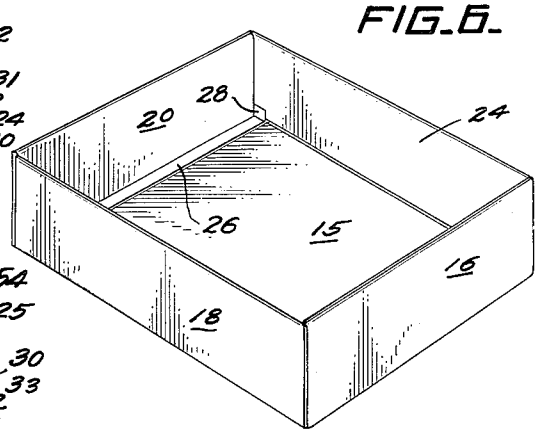


FIG. 2.

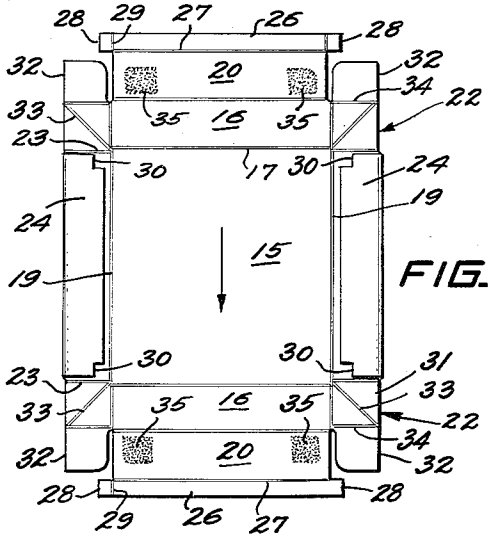


FIG. 3.

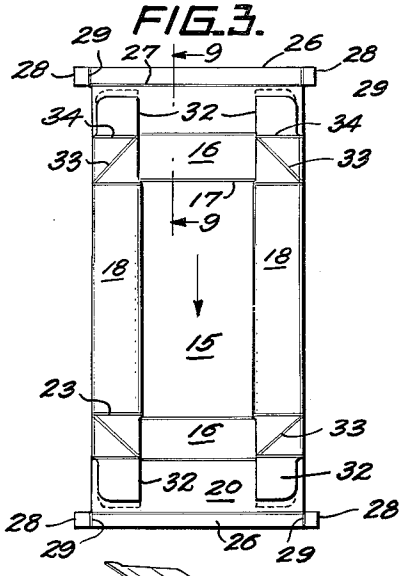


FIG. 4.

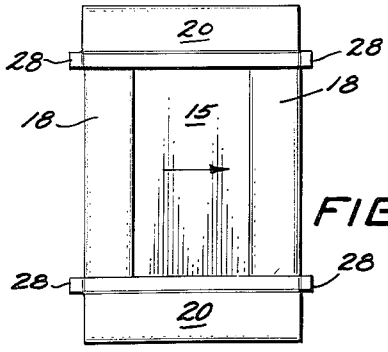
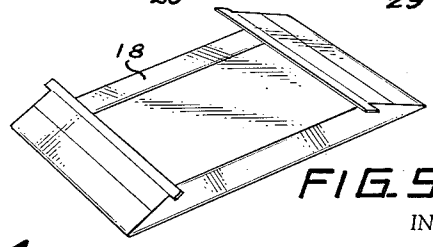


FIG. 5.



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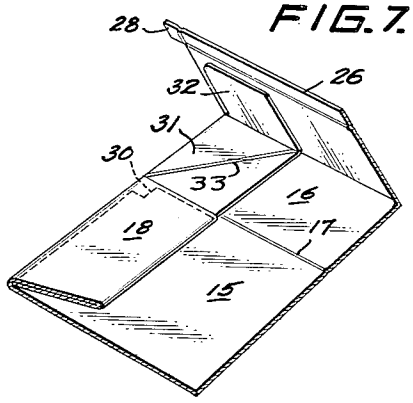
ATTORNEY

April 18, 1961 H. V. BOLDING 2,980,308

METHOD OF MANUFACTURE OF BOX AND STRUCTURE THEREOF

Filed March 8, 1957 2 Sheets-Sheet 2

FIG. 7.



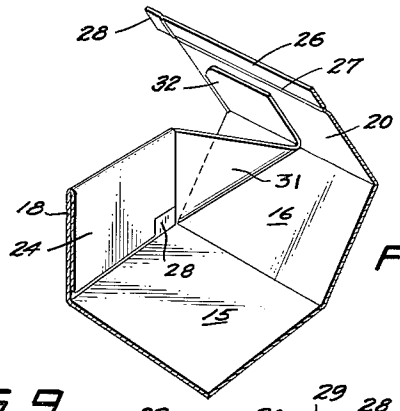
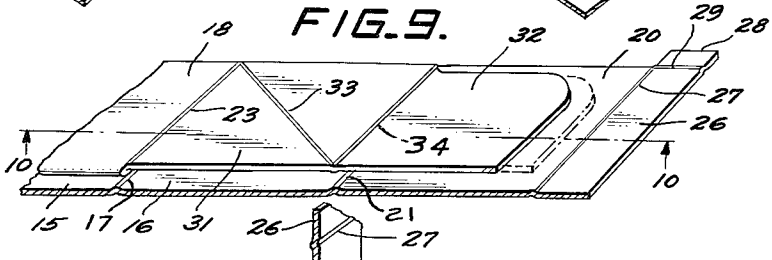


FIG. 8.

FIG. 9.



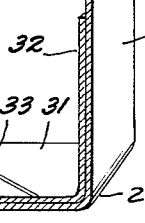
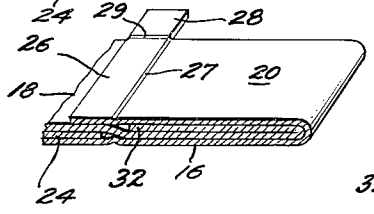


FIG. 10.

FIG. 11.



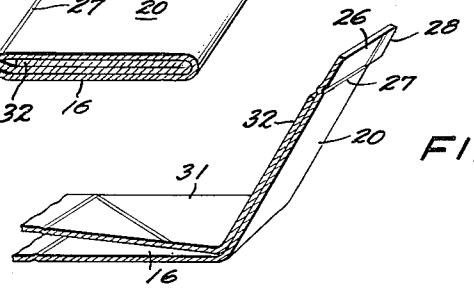


FIG. 12.

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United States Patent Office 2,980,308 Patented Apr. 18, 1961

2,980,308

METHOD OF MANUFACTURE OF BOX AND STRUCTURE THEREOF

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Filed Mar. 8, 1957, Ser. No. 644,843

1 Claim. (Cl. 229—31)

My invention relates to a new and improved method for manufacturing an erectable tray-type box from a single blank. Further my invention relates to a tray-type, single-blank box structure which incorporates elements for facilitating erection of the box by the simple application of opposed forces.

The method for making the box involves the steps of cutting and scoring a flat blank of sheet material, such as paperboard and the like, to provide longitudinal and transverse score or hinge lines which define a rectangular main panel from which extend two side walls and two end walls. Erecting panels extend from the transverse score lines on the end walls and force transmitting means are transversely hinged to the end edges of the side walls. Each force transmitting means includes a first member which is diagonally scored at 45° on a line from an adjacent corner of the main panel, and a second member which is transversely hinged at a score line to the end edge of the first member.

The cut and scored blank is then subjected to two folding operations. The first folding step involves the folding of the side walls and the force transmitting means inwardly through an arc of substantially 180°. The second step involves the folding of the erecting panels and the second members of the force transmitting means through an arc of substantially 180°.

After the first folding step, the second members of the force transmitting means are in a temporary first position in face-to-face sliding engagement with predetermined portions of the erecting panels. The second folding step causes the second members to slide across the faces of the erecting panels in a longitudinal direction toward the outer transverse ends of the erecting panels and assume a final second position.

The second members are then finally affixed to the erecting panels to maintain their final position therewith. In this manner return hinging movement of the erecting panels is limited to an arc of substantially less than 180° and slightly more than 90°.

To provide end wall structures having a minimum of internal stress yet rigid construction, the transverse score lines between the side walls and the first members of the force transmitting means are positioned longitudinally inwardly a small distance from the adjacent transverse end score lines of the main panel. In this fashion a space is provided between the end of each side wall and the respective end wall to accommodate the force transmitting means in sandwiched condition between the end walls and the erecting panels without causing undue internal stress or bucking of the side walls, thereby utilizing the entire strength of the blank as set up to provide a rigid box structure.

A double-thickness or two-ply wall may be provided for the entire wall structure of the box by adding side wall liners to the outer longitudinal edges of the side walls in the blank. Suitable means for interlocking the erecting panels at the corners of the box are provided for maintaining the box in erected condition.

Various other objects and meritorious features of my invention will be apparent from the following description taken in conjunction with the drawings wherein like numerals refer to like parts throughout the several figures and wherein:

Fig. 1 is a plan view of a cut and scored blank in accordance with my invention;

Fig. 2 is a view similar to Fig. 1 with the side wall liners folded inwardly;

Fig. 3 is a view similar to Fig. 2 with the side walls and the force transmitting means folded inwardly;

Fig. 4 is a view similar to Fig. 3 with the erecting panels folded inwardly;

Fig. 5 is a perspective view of the box in condition for erection by a user;

Fig. 6 is a perspective view of the erected box;

Fig. 7 is an enlarged perspective view of a corner of a box in condition for erection;

Fig. 8 is a view similar to Fig. 7 with the box halfway erected;

Fig. 9 is a perspective view of the upper left-hand portion of Fig. 3 taken on line 9—9;

Fig. 10 is a sectional perspective view of Fig. 9 taken on line 10—10 with the erecting panel raised to the vertical;

Fig. 11 is a sectional perspective view similar to Fig. 10 with the erecting panel swung inwardly to the horizontal; and

Fig. 12 is a sectional perspective view similar to Fig. 11 with the erecting panel swung outwardly to the fullest extent possible after the box has been completely manufactured.

As seen in Figs. 1–6, my invention comprises a blank which is cut and scored to provide a rectangular main panel 15, end walls 16 transversely hinged to the opposed end edges 17 thereof, side walls 18 longitudinally hinged to the opposed side edges 19 thereof, erecting panels 20 transversely hinged to the outer end edges 21 of the end walls, and force transmitting means 22 transversely hinged to the end edges 23 of the side walls 18. Each force transmitting means 22 is transversely scored at 34 to define a first member 31 and a second member 32, the first member 31 being diagonally scored at 45° from the intersection of the hinge lines 19 and 23 to provide hinges 33.

To provide double or two-ply side wall structures, side liner panels 24 are hingedly connected to the outer longitudinal edges 25 of the side walls 18. Means for maintaining the carton in erected condition are provided, and in the embodiment shown the means include bottom engaging panels 26 hinged to the transverse outer edges 27 of the erecting panels 20 and locking tabs 28 extending transversely outwardly from longitudinal hinge lines 29. These locking tabs 28 swing upwardly into the cut-out corner portions or notches 30 of the side liner panels 24, as seen in Fig. 6, when the box is erected.

In manufacture, sheet material is cut and scored to form the blank of Fig. 1, which is then longitudinally moved in the direction of the arrow shown in the center of the blank through automatic box making machinery which folds the side liner panels 24 inwardly over the side walls 18 (Fig. 2). The blank continues longitudinal forward movement through the machine and the side walls 18 and force transmitting means 22 are folded inwardly (Fig. 3), thereby placing the side walls 18 over the main panel 15, the first members 31 over the end walls 16, and the second members 32 over the erecting panels 20.

The blank is then moved transversely as shown by the arrow on the blank in Fig. 4, and the erecting panels 20 are folded inwardly, thereby causing the second members 32 to slide on the erecting panels 20 longitudinally

toward the outer transverse edges 27 thereof to a final second position. The second members 32 are then permanently affixed to predetermined portions of the erecting panels 20.

The box is then in condition for shipment to a user and, when used, the carton will be in the condition shown in Fig. 5 whereby opposing forces applied at the ends will automatically bring the walls into vertical position. In this connection, although it has not been indicated in Figures 10 and 12, when the erecting panels 20 are raised to upright positions, the offset relation between the hinge lines 21 and 34 will cause the first members 31 to be lifted with respect to the adjacent faces of the end walls 16. The erecting panels 20 may then be swung downwardly into vertical position to accomplish interlocking of the means for maintaining the box in erected condition. In this particular embodiment the tabs 28 snap into the notches 30 in the side wall liners 24.

In the method above, the blank is preferably sent through an adhesive applying mechanism prior to folding whereby longitudinal paths 54 of adhesive are applied to the outer edges of the side wall liners 24 and rectangular areas 35 are applied to the erecting panels 20. It will be appreciated that other adhesive arrangements on the blank could be employed, if desired.

Upon erection of the carton the first members 31 will fold along their diagonal score lines 33, as shown in the enlarged views of Figs. 7 and 8. It will be noted in Figs. 5 and 7 that the side walls 18 tend to bow upwardly when the box is in collapsed condition, this property facilitating the proper folding of the first members 31. This property is built into the box structure during the manufacture thereof. It will be noted in Fig. 4 that there are fewer plies of cardboard at the sides of the blank than at the ends of the blank, thereby reducing the pressing or creasing of the score lines 19 between the main panel 15 and the side walls 18 when the blank is passed between pressers to set finally the glued areas.

As seen in Figs. 9–12, the second member 32, when folded inwardly over the erecting panel 20, assumes a temporary first position. Upon folding the erecting panel 20 inwardly about transverse score line 21 through an arc of substantially 180°, the second member 32 slides across the face of the erecting panel 20, reaching its final second position as shown in Fig. 11. The second member 32 is then permanently affixed to the erecting panel 20. As seen in Fig. 12, the possible return hinging action of the erecting panel is thereby limited to substantially less than 180° and slightly more than 90°, the full opening pivotal movement being shown in Fig. 12.

To reduce the internal stresses at the end wall structures of the box, the transverse score lines 23 of the force transmitting means are positioned longitudinally inwardly of the transverse end edges 17 of the main panel 15, thereby providing housing room for the force transmitting means within the space formed by the end walls 16 and the erecting panels 20. It will be noted that hinge lines 34 of the second members 32 are similarly spaced inwardly for the same purpose.

Preferably adhesives are used and applied at an early stage of manufacture, these adhesives being of the type which will not permanently set up for a period of, for example, ten to twelve seconds, whereby the blank of Fig. 1 may be moved by the machinery through the various stages to the stage shown in Fig. 4 where final permanent adherence can be accomplished.

Various other modified forms of the invention will be apparent from the foregoing description and for that reason I wish to limit myself only within the scope of the appended claim.

I claim:

A tray type erectable box comprising, in collapsed condition, a rectangular main panel, end walls hinged to the opposite end edges of said main panel and extending outwardly of and substantially coplanar with said main panel, side walls longitudinally hinged to the opposed side edges of said main panel and extending inwardly so as to overlie said main panel, erecting panels hinged to the outer end edges of said end walls and overlying said end walls, motion transmitting connections between said side walls and said erecting panels, each of said motion transmitting connections including a first member hinged to an end edge of one of said side walls and lying in the same plane therewith so as to overlie part of the adjacent end wall, and a second member hinged to the end edge of said first member on a line substantially juxtaposed but offset inwardly of the hinge line between the end wall and the erecting panel, said second member being interposed between the first member and the adjacent erecting panel and affixed in face-to-face relationship with said adjacent erecting panel so as to maintain the juxtaposed relationship in the hinges between the first and second members on the one hand and the end wall and the erecting panel on the other hand, the spacing between the said offset hinge lines being such as to afford a hinged movement to said erecting panel of more than 90 degrees and less than 180 degrees from a position overlying the end wall, the said offset hinge lines causing the pivotal movement of the erecting panel from its collapsed condition to lift the first member in relation to the adjacent end wall to help start the proper erection of the carton, said first member having a diagonally hinged line causing the upper surfaces of the two sections defined thereby to assume face-to-face engagement in erected condition, and locking means carried by each of the erecting panels for maintaining the end walls and the side walls in erected condition when the box is erected.

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