Jan. 22, 1963 H. V. KINDSETH ETAL 3,074,617

CONTAINER STRUCTURE AND METHOD

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FIG. 1

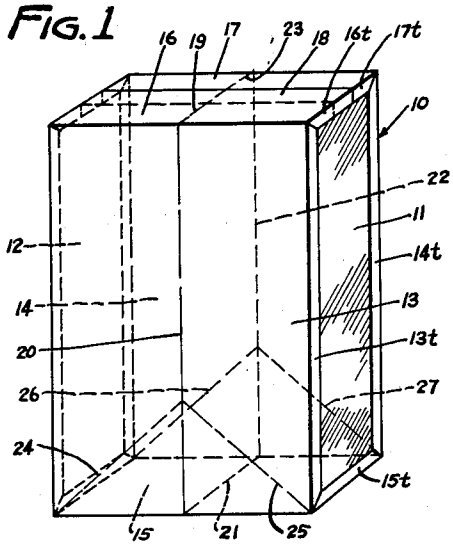


FIG. 2

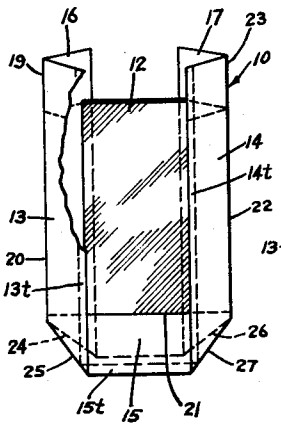


FIG. 3

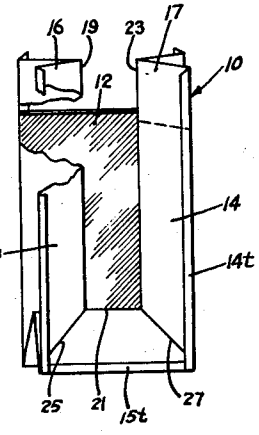


FIG. 4

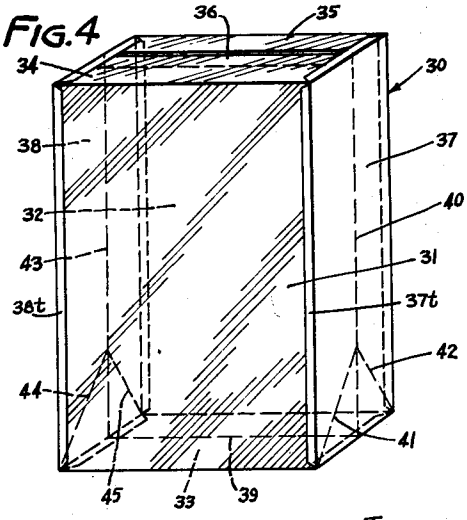
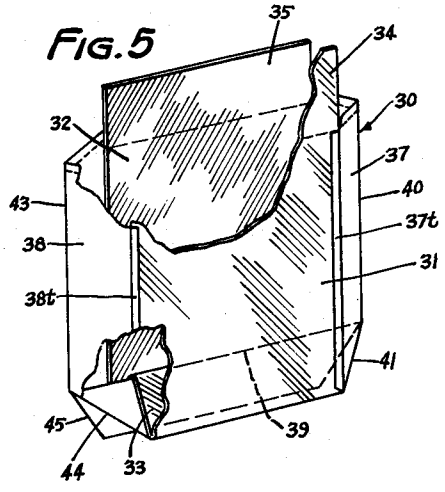


FIG. 5



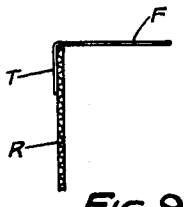


FIG. 9

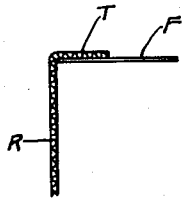


FIG. 10

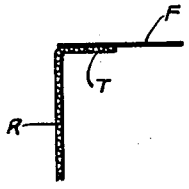


FIG. 11

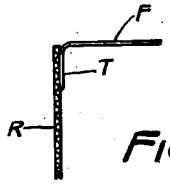


FIG. 12

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FIG. 6

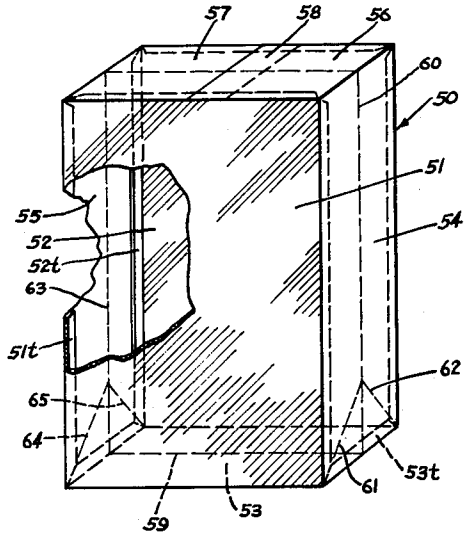
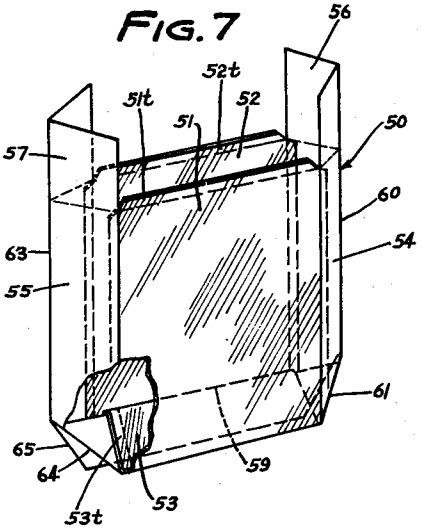


FIG. 7



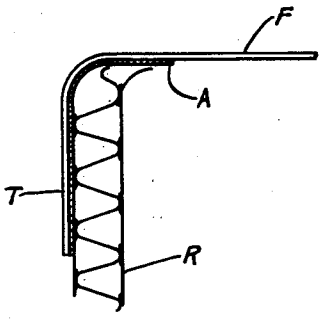


FIG. 13

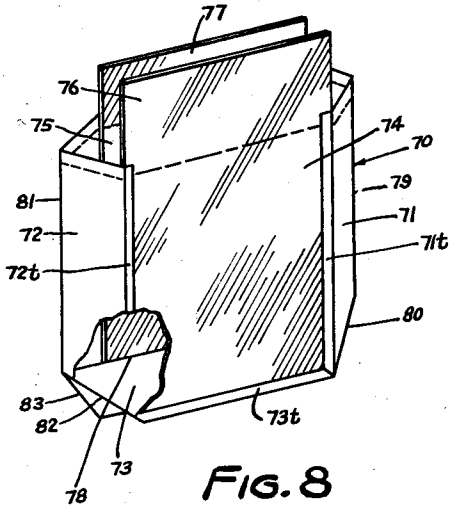


FIG. 8

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CONTAINER STRUCTURE AND METHOD

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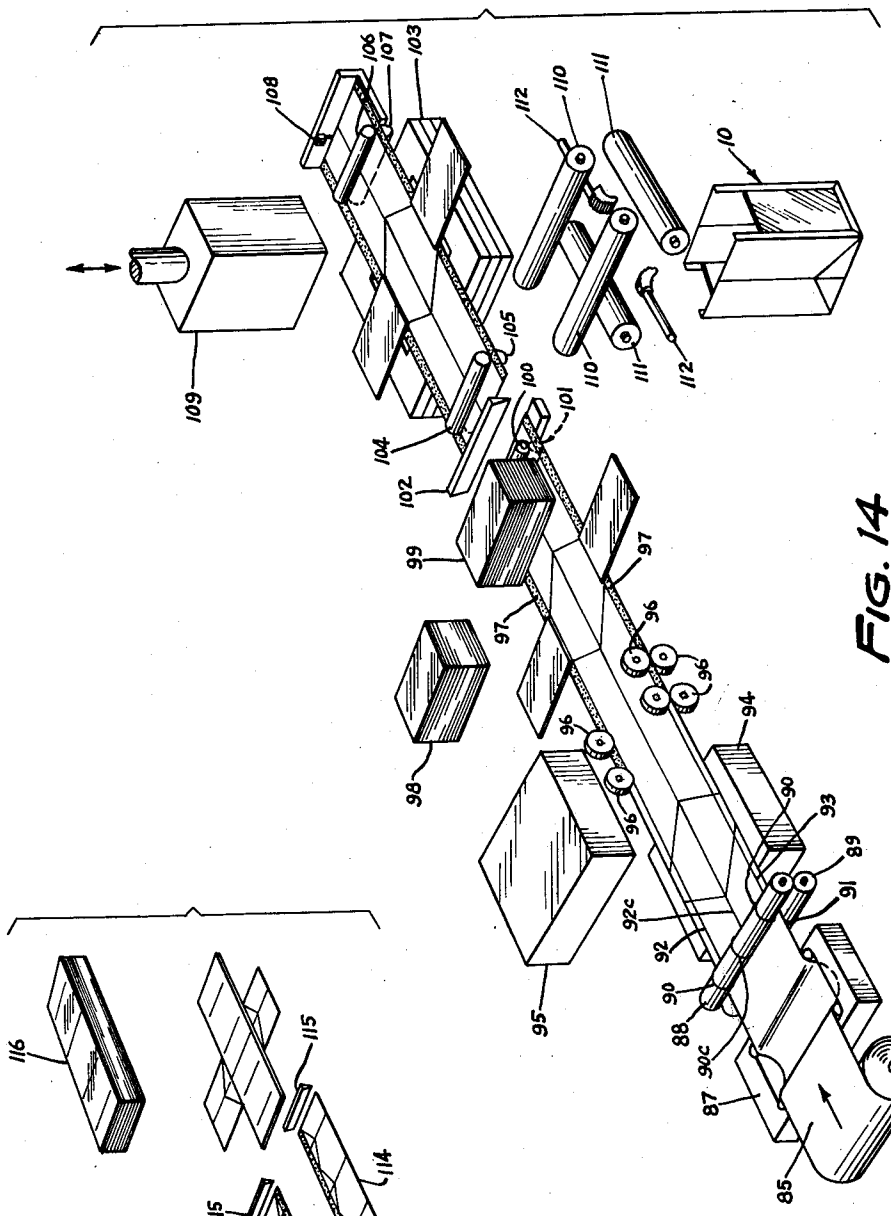


FIG. 14

FIG. 15

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CONTAINER STRUCTURE AND METHOD

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Filed Mar. 17, 1958, Ser. No. 722,060
25 Claims. (Cl. 229—55)

This invention relates to collapsible shipping containers. This invention relates especially to collapsible containers which are provided with an opening on one end for filling and which after being filled acquire the shape of a rectangular parallelpiped. Many of the advantages of this invention derive from the provisions giving the container the characteristics of a collapsible bag and also those of a fairly rigid carton.

Conventional paper or textile bags or balers do not provide a rigid package and because of the bending and distortion which results from handling, certain limitations are placed on their use. Furthermore, because conventional bags and balers are flexible, they must be laid on their side for stacking. If the bags are to be stacked, it is apparent that the contents are necessarily limited to those materials which are not subject to damage from pressure or crushing. This restriction limits their use to such products as fibrous, powdery or granular materials or fluids.

Pasted bottom bags and balers utilize a quantity of material in the overlapping pasted flaps which does not increase the bags strength. Thus, as far as contributing to the containers strength is concerned, the overlapping flaps may be considered wasted. Another shortcoming of conventional bags is that they do not provide an attractive flat surface for labeling. This shortcoming is especially important in retail packages in which the appearance of the label determines to a great extent whether or not the item is sold. It is also apparent that limitations are placed on the utility of conventional bags and balers because of their overall structure weakness and low puncture resistance.

Corrugated fiber shipping cartons, on the other hand, are used in certain similar applications and while not suffering from the above shortcomings, they are often times very difficult to open and after being emptied require a substantial effort to flatten for disposal. As a result, handling empty cartons becomes a problem in retail stores and the accumulation of empty unflattened cartons may require a considerable storage area. It is a necessity because of the geometry of standard corrugated cartons that a substantial amount of overlapping occurs in the material making up the end flaps of the containers. Much of this overlapping material does not increase the package's overall strength and thus, from a strength standpoint, may be considered wasted. Attempts have been made to increase the rigidity of conventional bags by positioning paper-board sheets along the inside walls, but these bags suffer from inherent shortcomings. Furthermore, no efficient method of manufacturing such bags has been developed and the overlapping of the sheets results in a substantial lack of economy.

It is a primary object of this invention to provide a shipping container which furnishes a substantial amount of rigidity so as to protect the contents from damage caused by distortion and pressure and yet is collapsible.

It is a further object to provide a collapsible container which through its rigidity furnishes superior symmetry, appearance, stackability and filling ease than does a bag.

It is an important object of this invention to provide a semi-rigid shipping container which may be delivered flat and requires closing on only one end.

It is another object of this invention to provide a semi-rigid shipping container which may be opened more easily than standard corrugated fiber shipping containers and which is more easily flattened after emptying for reuse or disposal than standard corrugated fiber shipping containers.

It is a further object to provide a semi-rigid shipping container which requires less overlapping material than is used in the folds of a pasted end bag or baler or in the overlapping flaps of a carton.

It is a further object to provide a shipping container with a substantial amount of rigidity which possesses a high degree of waterproofness and moistureproofness.

It is still a further object to provide a baler which is better adapted for palletizing, filling and for display purposes.

It is another object to provide a very economical shipping container in relation to performance.

It is an object to provide a highly efficient method for manufacturing containers of this invention.

Other objects will become apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated by the drawings in which the same numerals refer to corresponding parts and in which:

FIGURE 1 is a perspective view of one embodiment of this invention wherein two opposing walls are rigid and the others are flexible;

FIGURE 2 is a perspective view of the embodiment illustrated in FIGURE 1 shown partly broken away and partially collapsed with the rigid wall closest the observer removed;

FIGURE 3 is a perspective view similar to FIGURE 2 but illustrating an alternative collapsing arrangement;

FIGURE 4 is a perspective view of another embodiment of the invention wherein four walls are rigid and the remaining two are flexible;

FIGURE 5 is a perspective view of the embodiment illustrated in FIGURE 4 shown in a partially collapsed position and partly broken away;

FIGURE 6 is a perspective view of still another embodiment of the invention wherein three walls are rigid and three are flexible, partly broken away;

FIGURE 7 is a perspective view of the embodiment illustrated in FIGURE 6 in a partially collapsed position and partly broken away;

FIGURE 8 is a perspective view of a still further embodiment of this invention shown partially collapsed and partly broken away;

FIGURE 9 is an enlarged fragmentary section through a corner of the container showing one form of lap seam;

FIGURE 10 is a fragmentary section similar to FIGURE 9 showing a second form of seam;

FIGURE 11 is a sectional view similar to FIGURE 9 showing a third type of seam;

FIGURE 12 is a sectional view similar to FIGURE 9 showing a fourth type of lap seam;

FIGURE 13 is an enlarged fragmentary section taken through the corner seam of one form of this invention;

FIGURE 14 is a schematic and diagrammatic illustration of one method of producing containers of this invention; and

FIGURE 15 is a similar illustration of a modified method of producing containers.

Referring to the drawings and particularly to FIGURES 1, 2 and 3, there is shown a baler bag indicated generally at 10 wherein the opposite side or end walls 11 and 12 are rigid and may be composed of corrugated board, fiber board, or the like. The other walls, side walls 13 and 14, and bottom wall 15 and the portions 16 and 17 which overlap at seam 18 to form a top wall are all composed of a single flexible sheet of kraft paper or like sheet material. Each of the flexible walls 13, 14, 15, etc. is folded along its free marginal edges to provide elongated tabs 13*t*, 14*t*, 15*t*, etc., which overlap and are adhesively bonded to the edges of the rigid wall panels 11 and 12.

It will be noted that all of the flexible walls are formed from a single length of sheet material with single transverse fold lines between the adjacent wall portions. The single strip of flexible sheet material from which the flexible side walls are formed is folded along its longitudinal center line to form a fold line 19 in the top wall portion 16, a fold line 20 in the side wall 13, a fold line 21 in the bottom wall 15, a fold line 22 in the side wall 14 and a fold line 23 in the top wall portion 17. Flexible side wall 13 is also provided with a pair of 45° oblique bellows fold lines 24 and 25 extending from a point along the central fold line 20 to the bottom outside corners of the wall where it joins the bottom wall and the rigid end panels. The other flexible side wall 14 is similarly provided with 45° bellows fold lines 26 and 27.

As shown in FIGURE 2, the container may be flattened to form a flat tube with a V-bottom. Top wall portion 16 and the portion of side wall 13 above the bellows fold lines 24 and 25 are folded to project outwardly along with top wall portion 17 and that portion of side wall 14 above the oblique fold lines 26 and 27 while the bottom wall and the portion of the side walls 13 and 14 below the bellows fold lines are folded inwardly to produce the V-bottom.

As shown in FIGURE 3, the top and side flexible walls may also be folded so that the bellows project inwardly from the edges of the rigid panels 11 and 12 to form in-tucks or gussets. As explained hereinafter in some instances the baler bag may be formed around the product to be contained in it, or the container may be filled immediately after its formation. When this is done, of course, the baler bag is not flattened. When the container is being filled, the top wall portions 16 and 17 and their respective tabs 16*t* and 17*t* stand upright and when the container is filled, the portions 16 and 17 are folded down and overlapped to form the seam 18 and adhesively secured. At the same time, the tabs 16*t* and 17*t* are adhesively secured to the top edges of the rigid panels 11 and 12.

Referring now to FIGURES 4 and 5, there is here shown a second embodiment of the invention indicated generally at 30. In the baler bag 30, the side walls 31 and 32, the bottom wall 33, and the top wall comprised of panels 34 and 35 overlapped along a seam 36 are all composed of rigid sheet material such as corrugated board, paper board, or the like. It will be noted that the top panel member 34, the side wall panel 31, the bottom wall panel 33, the opposite wall panel 32 and top panel 35 are all formed from a single continuous length of sheet material folded along a transverse fold line between each of the adjacent panel wall members. The side or end walls 37 and 38 are each formed from flexible sheet material such as kraft paper. The end walls are provided with elongated tabs 37*t* and 38*t* formed by folding over the marginal edges of the flexible walls and by these means are adhesively secured to the rigid panel members.

The bottom wall panel 33 is provided with a central fold line 39 so that the baler 30 may be flattened with a V-bottom as shown in FIGURE 5. The flexible walls 37 and 38 serve as bellows to permit flattening of the container and to this end wall 37 is provided with a central

longitudinal fold line 40 and with a pair of oblique bellows fold lines 41 and 43 extending from a point on the fold line 40 to the flexible walls where they join the rigid bottom and side wall panels. Similarly, flexible wall 38 is provided with a central longitudinal fold line 43 and oblique fold lines 44 and 45.

As shown in FIGURE 5, the bellows formed in the flexible walls 37 and 38 project outwardly to permit the baler bag to be flattened for shipment and storage. After filling, this bag is closed by folding the top panels 34 and 35 over into overlapping relationship and bonding them together along the overlapped seam 36. The tabs at the upper ends of the flexible walls 37 and 38 are folded at right angles and adhesively secured in overlapping relationship to the rigid top wall of the container.

A third embodiment of this invention, indicated generally at 50, is shown in FIGURES 6 and 7. The bag 50 comprises rigid side wall panels 51 and 52 and bottom wall panel 53 all formed from a single sheet of rigid material with the adjacent wall panels joined along a transverse fold line. Each of the wall panels 51, 52, and 53 is folded over along its free marginal edges to provide a narrow elongated fastening tab 51*t*, 52*t*, etc. The bag 50 is provided with flexible side or end walls 54 and 55 and a flexible top wall made up of portions 56 and 57 overlapped along a seam 58. End wall 54 and top wall portion 56 are formed from a single sheet of flexible material and are joined along a fold line. Similarly, end wall 55 and top wall portion 57 are formed from a single sheet and joined along a fold line. The end walls are adhesively secured to the tabs 51*t*, 52*t*, etc., of the side and bottom rigid wall panels.

The rigid bottom wall 53 is provided with a central transverse fold line 59 to facilitate the formation of a V-bottom when the bag is flattened. The flexible end walls and top wall portions form bellows to permit flattening of the bag. To this end, flexible end wall 54 and top wall portion 56 are provided with a continuous central longitudinal fold line 60 and end wall 54 is provided with a pair of oblique fold lines 61 and 62 extending from a point on the fold line 60 to the corners of the wall where is joins the rigid side and bottom walls. Similarly, end wall 55 and top wall portion 57 is provided with a continuous central longitudinal fold line 63 and the end wall is provided also with a pair of oblique fold lines 64 and 65.

As shown in FIGURE 7, the baler bag 50 may be flattened by folding the V-bottom of the bag inwardly and folding the bellows formed by the flexible end walls and top wall portions to project outwardly. When this bag is filled, the tabs 51*t* and 52*t* along the top edges of the rigid side wall panels are folded inwardly and the flexible top wall portions 56 and 57 are folded inwardly and adhesively secured to the tabs and along the overlapping seam 58.

In FIGURE 8 there is shown a fourth embodiment of the baler bag of this invention indicated generally at 70. This bag 70 comprises flexible side or end walls 71 and 72 and a flexible bottom wall 73 all formed from a single length of flexible sheet material. The adjacent wall portions are joined along transverse fold lines. The free marginal edges of the flexible walls are folded over to form narrow projecting fastening tabs 71*t*, 72*t*, etc. The baler bag 70 includes rigid side walls 74 and 75, and a rigid top wall formed from panels 76 and 77. Side wall 74 and top panel 76 are formed from a single sheet of rigid sheet material and are joined along a fold line, as are side wall panel 75 and top panel 77.

The flexible bottom wall 73 is provided with a central fold line 78 to facilitate the formation of a V-bottom. Flexible end wall 71 is provided with a central longitudinal fold line 79 and a pair of oblique bellows fold lines of which only one, 80, is shown in this figure. Similarly flexible side wall 72 is provided with a central longitudinal fold line 81 and a pair of oblique bellows fold lines 82 and 83. This permits the V-bottom to be folded inwardly

and the side wall bellows to be projected outwardly to permit the bag 70 to be flattened for shipment or storage. The rigid wall panels are secured to the flexible walls by means of adhesive applied to the projecting tabs 71*t*, 72*t*, etc., of the flexible walls. When this bag is filled, it is closed by folding the rigid top wall panels inwardly in overlapping relationship and adhesively securing the resulting seam. The projecting tabs on the top marginal edge of the flexible end walls 71 and 72 are then folded inwardly and adhesively secured to the newly formed top wall.

In FIGURES 9 through 13 there are shown alternative forms of seam construction for joining the flexible and rigid walls to one another. Any of these forms of construction may be used in any one of the embodiments of the invention. According to the form of construction shown in FIGURE 9, the projecting tab T is formed by folding over the marginal edge of a flexible sheet F and the inside surface of the tab is adhesively secured to the outside surface of a rigid sheet R. According to FIGURE 10, the tab T is formed by folding a marginal edge of a rigid sheet R and the inside of the tab is secured to the outside surface of a flexible sheet F.

In FIGURE 11 there is shown a form of construction similar to that of FIGURE 10 except that the outside surface of the tab T is secured to the inside surface of the flexible sheet F. In FIGURE 12 there is shown a form of construction similar to that of FIGURE 9 except that the outside surface of the tab T is secured to the inside surface of the rigid sheet R.

A slightly modified form of seam construction is shown in the enlarged fragmentary sectional view in FIGURE 13. This seam which has been found to be economical, readily constructed, and which performs well, is made by bending over the free marginal edge of the rigid panel R and adhering the tab T of the flexible sheet F to the outer face of the rigid panel by means of adhesive layer A so that the flexible sheet is given uniform support over the rounded edge surface of the rigid panel. Preferably, according to this form of construction, the rigid panel is cut along the marginal edge at an angle of from about 45° to 60° from the plane of the panel so that upon bending the edge over, the portion of the rigid panel edge adjacent the flexible sheet projects beyond the inside surface of the rigid sheet. In each of FIGURES 9 through 13 the rigid sheet R has been illustrated as a double-spaced corrugated board.

The form of construction shown in FIGURE 9 has the advantage of providing straight flat surfaces on both the inside and the outside of the baler bag but in some instances, the flexible material has a tendency to tear over the stiff edge of the rigid material. This tendency to tear is obviated by the form of construction shown in FIGURE 13. The seam shown in FIGURE 10 is more difficult to fabricate than that shown in FIGURE 9 because the tab formed in the rigid sheet matarial has a tendency to spring back before the adhesive has set. On the other hand, this tab provides protection around the corners where the package is subject to the most damage.

The seam shown in FIGURE 10 is especially useful in packaging cans where the chime has a tendency to tear the edges of a package. The seam shown in FIGURE 11 provides the same protection as that shown in FIGURE 10, but it does not provide a flat surface on the inside of the container. The seam illustrated in FIGURE 12 provides flat surfaces on both inside and outside but it has been found that in some instances the flexible material has a tendency to peel away from the rigid panel under tension. It is apparent that the form of seam construction selected for any particular batch of baler bags is dependent to a large extent upon the material to be packaged and the conditions to which the packages are to be subjected.

It will be apparent that any of the embodiments of the invention illustrated may be collapsed before filling either with the bellows tucked into form gussets as shown in FIGURE 3 or with the bellows projecting outward to form a flat tube with a V-bottom as shown in FIGURE 2. Ordinarily, the in-tuck form takes up less space and affords greater economy in shipping.

As explained, the seam tabs may be provided in either the rigid panels or the flexible wall sheets as desired for the particular application in which the container is to be used. If an especially tight seal is required at the corners, no material need be removed from between adjacent tabs on the same sheet. The excess tab material will be bonded to itself at the corners to produce a small ear which may be either allowed to hang free or passed down along the side of the container.

In a normal corrugated carton a small opening inherently results at the corner of the carton at the intersection of adjacent flaps. If a fine powdered or granular material is packaged in the carton, some seepage of material may take place through that opening unless it is especially sealed by means of tape or otherwise. The container of this invention obviates such seepage and makes possible the complete sealing of the corners of the container without special sealing tape or other adjunct for that purpose.

The rigid material used in the construction of the container of this invention may be any of the stiff base sheet materials used in the packaging industry. The flexible materials include paper, coated or laminated paper, laminated foils, plastic films, scrim, woven or non-woven textile fabric, reinforced paper and the like. When the flexible sheet material is very thin and supple or is open woven as is the case with plastic film, light weight paper or scrim, it will be apparent that scoring is unnecessary and may be dispensed with. Either the rigid panels or the flexible sheets may be overlaid with fine quality printed sheets if desired. Alternatively, the panels or bellows may be preprinted. A completely waterproof container may be formed by using flexible sheets and panels carrying a waterproof coating and waterproof adhesive. Because a continuous seal may be provided at all corners and edges as explained above, a completely water tight package may be produced. Moisture vapor protection is especially important in packaging food products such as dry breakfast cereal and in chemicals sensitive to loss or gain of moisture content.

The containers formed according to this invention may be made of any desired size and while best adapted as a master container for unit packages such as paper towels, napkins, toilet tissue, clothing items, small packages of fruit products and the like, it may also be used as a primary package to hold the product directly, for example, apples or oranges or the like. The containers according to this invention are useful in packaging frozen fruit because the flexible sheet material allows more rapid transfer of heat than will a heavier material. For maximum efficiency, the flexible walls of the container are placed against the cooling surface.

Because of their semi-flexibility the containers of this invention are slightly adjustable in volume and because of this, a tighter package results than with a package constructed entirely of rigid material. This tightness prevents the unit packages from shifting relative to one another and shearing forces within the packages are thereby avoided. The flexible walls of the containers absorb a great deal of strain and shock energy while the package is being transported and handled. This is especially true when the flexible sheet is a creped paper, stretchable paper or the like. The result is a higher strength per unit weight ratio in many cases than a package of 100 percent rigid material.

Easy opening features are simple to incorporate in the baler bag of this invention by adding a tear strip or perforated line in either the longitudinal or transverse direction of the paper. Either of these can be located so as to divide the package into two similar units. When the

unit packages in the baler are arranged in two rows vertically with their tops facing inwardly, the proper location of this easy opening feature will make it possible to easily divide the baler into two identical half packages with the tops of all unit packages exposed for fast, easy price marking.

In FIGURE 14, there is shown in simplified schematic and diagrammatic form, apparatus means for carrying out the method of making the semi-rigid containers of this invention. FIGURE 14 illustrates specifically the manner in which the embodiment of the invention illustrated in FIGURES 1, 2 and 3 is formed. A web 85 of flexible sheet material, such as paper or the like, is unwound from a supply reel 86 driven at a uniform speed by any suitable and conventional motor means. The web 85 is passed over a vacuum box length compensator 87 and thence between a pair of intermittently operated draw rolls 88 and 89. The web length compensator 87 takes up slack web material so that the web is permitted to advance intermittently as a result of the intermittent action of the draw rolls 88 and 89.

The two pairs of circumferential scoring rings, 90 and 91, are positioned opposite each other on the draw rolls 88 and 89 to form score lines 92 and 93 on the moving web 85. A third pair of scoring rings, of which only one, 90c, is visible, scores a center line 92c on the web 85. During the period of time in which the advance of the web 85 is interrupted by the intermittent action of the draw roll a scoring press comprising a stationary lower member 94 positioned beneath the web and a slidably mounted matching member 95 positioned above the web are brought into engagement on opposite sides of the web to impress a predetermined pattern of embossed bellows fold lines onto the web in cooperation with the center line.

By reference to FIGURE 1, it will be noted that the combined pattern of fold lines includes the central longitudinal fold lines in the top, side and bottom walls and all of the oblique fold lines 24, 25, 26 and 27 in the flexible side walls. Means to coordinate the embossing step with the web advancing step and to determine the frequency thereof are conventional and readily available and will be immediately apparent to those skilled in this art. The fold lines may be embossed on the paper web by other means such as, for example, by means of matched pattern rolls. If such means are used, the intermittent operation of rolls 88 and 89 and the web length compensator 87 may be dispensed with. The reciprocating press method, however, is preferred because dies of different sizes may be interchanged more conveniently.

Adhesive is applied to one side of the web in the space between the marginal edge and the score lines 92 and 93 by any convenient and conventional means such as the roller applicators 96 here illustrated. The adhesive may be either wet moisture-sensitive type material which sets upon drying, or it may be thermoplastic. If the web 85 itself is formed of a thermoplastic material or is precoated along the edges with a thermoplastic material having adhesive properties, the sheet forming the finished container may be sealed together in subsequent steps by the use of heat and pressure, and, in this instance, the adhesive applicator 96 may also be dispensed with.

Two stacks 98 and 99 of pre-cut rigid sheets are supplied above the moving web. The lowermost rigid sheet from each of these stacks is positioned with respect to the web 85 preferably while the forward motion of the web is interrupted. The rigid panels are positioned at predetermined intervals along the edge of the web 85 adjacent to and in registry with the pattern of score lines impressed in the web. The rigid panels are bonded to the flexible web by means of the adhesive edge coatings 97 previously applied to the web. The composite of the web and rigid panel is generally in the form of a cross. It will be noted that the area of the web 85 between the rigid panels forms the bottom wall of the finished bag.

The web is guided through a set of guide rolls 100 and 101 and through a cut-off device, here illustrated as a knife blade 102, for severing the advancing web into successive bag lengths. It is apparent that a rotary cutter or equivalent cutter means may be substituted for the knife blade illustrated. The cut-off is synchronized with the other operations by well known and conventional means to provide the proper dimensions in the finished baler bag.

From the cut-off means the baler bag blank is passed to a forming die 103. Two pairs of rolls, 104 and 105 and 106 and 107, are positioned on either side of the die 103 for conveying the bag blanks into position over the dies. If necessary, a set of speed accelerating rolls may be positioned between the cut-off means and the forming die for separating the cut container blanks and providing ample time for the die forming and sealing operations. The rolls 104–107 are mounted for sliding in the plane normal to the plane of the container blank so that they may be separated by suitable actuator means to free the blank from the rolls. A switch 108 which senses the cut end of the blank as it reaches a position directly over the sequencing dies 103 may be used for separating the rolls 104–107 by setting in motion an actuator such as a pair of hydraulic cylinders or like means so that the blank will be free to move into the dies when engaged by the mandrel 109. Alternatively, a grab mechanism may be used to draw the cut blanks into position over the sequencing dies 103.

When the composite blank composed of flexible web material 85 and the two rigid panels from stacks 98 and 99 is brought into position over the sequencing dies 103, a mandrel 109 slidably mounted above the dies 103 is brought down into contact with the container blank and continues on through the die, said dies forcing the adjacent edges of the sheets into overlapping relationship. Preferably the displacement of the mandrel 109 is initiated by the action of the switch 108. As the mandrel covered by the newly formed baler bag emerges from the opposite side of the die, it passes through two pairs of opposed rolls 110 and 111 which apply pressure to the seams for the purpose of insuring a better bond between the folded over projecting tabs of the flexible sheet material and the adjacent edges of the rigid panels. A pair of peel off dogs 112 frictionally engage opposite sides of the finished baler bag and remove it from the mandrel as the mandrel is retracted. The finished baler may then be filled or collapsed and stacked for shipment or storage. Where the product to be packaged within the semi-rigid container is itself strong and rigid and the shape of the useful space inside the container the product itself may be used as the mandrel.

In FIGURE 15 there is shown in a fragmentary schematic perspective view modified means for accomplishing manufacture of balers which include a single sheet of rigid material forming a plurality of panels of the finished baler such as those illustrated in FIGURES 4, 5, 6 and 7. According to this form of manufacture, two flexible webs, 113 and 114, are advanced, scored, adhesive is applied, and the webs are cut off to the proper length, as by cutters 115, all as previously described. The lowermost sheet from a stack of rigid pre-scored panelled sheets is positioned in the path of travel of the webs 113 and 114 and the cut-off segments of the flexible webs are bonded to the opposite edges of the rigid sheet. The cross-shaped blank thusly formed is passed through forming dies and bonded together generally in the manner already described. It will be apparent that this method may be used to produce balers in which either three or four panels are rigid.

The invention is more fully illustrated by the following examples:

Example I

A baler was made similar to that in FIGURES 1 and 2. A sheet of 120 lb. basis weight natural flat kraft paper was used to make four sides and two sheets of 200 lb.

test C flute corrugated board make up the other two. The sheets were combined in the manner disclosed, tabs being provided on the kraft paper to make a baler 18½" x 17⅛" x 25⅜". The two corrugated panels had the dimensions 18½" x 17⅛". The paper tabs overlapped the corrugated 1½" as in FIGURE 13 and were bonded thereto with a starch dextrin adhesive. Dry cereal was packaged therein giving the package a weight of 25 lbs. The container was economical, opened easily before filling, was filled easily and provided adequate protection for the product in normal conditions of use. Furthermore the container was easily opened and no special effort was necessary to collapse it after emptying.

Example II

A baler was made similar to that in FIGURES 6 and 7 using the same corrugated stock as in Example I but with 120 lb. basis weight on machine-creped kraft, having about 5% to 12% stretch. The baler had the dimensions 20½" x 12⅝" x 15¼", a single sheet of corrugated board providing three sides and having 1½" tabs along its edges. The kraft sheets provided the two sides measuring 20½" x 15¼" and the top measuring 12⅝" x 15¼". The package was filled with paper towels and weighed 40 lbs. This container provided somewhat superior protection over that in Example I due to the rigid materials offering better protection in the corners.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. The specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

We claim:

1. A semi-rigid container having a top and bottom and four side walls and composed of sheet material formed to provide a container space substantially in the form of a rectangular parallelepiped when said container is filled and closed, and foldable to a flat condition when empty, at least two and no more than four of the walls of said container being composed of rigid sheet material, the remaining walls of said container being composed of relatively thin flexible sheet material, the edges of said rigid container walls being secured to the adjacent edges of said flexible walls by means of an infolded marginal edge tab of one wall secured to the marginal edge of an adjacent wall composed of different material, two opposed parallel side walls adjacent the bottom wall being flexible and the remaining two side walls adjacent the bottom wall being rigid, a central fold line in said bottom wall extending from one of said adjacent flexible side walls to the other, a central fold line in each of said adjacent flexible side walls and extending upward from said bottom wall fold and a pair of oblique bellows fold lines in said flexible side walls at the ends adjacent to said bottom walls.

2. A semi-rigid container according to claim 1 further characterized in that the top wall of said container is composed of two rectangular portions of sheet material whose total combined area is greater than that of the opposite parallel rectangular bottom wall to provide for an overlapping closing seam.

3. A semi-rigid container according to claim 1 further characterized in that adjacent walls of said container composed of like sheet material are formed from a single length of said sheet material and separated only by a transverse fold line.

4. A semi-rigid container according to claim 1 further characterized in that the infolded marginal edge tabs of the walls of said container are secured to the marginal edges of adjacent walls composed of different material by adhesive disposed on the surfaces of said tabs.

5. A semi-rigid container according to claim 4 further characterized in that said adhesive is a fast setting thermosplastic adhesive.

6. A semi-rigid container according to claim 1 further characterized in that the marginal edge tabs used for securing together container walls composed of different materials are formed by folding over the free marginal edges of the walls composed of flexible sheet material.

7. A semi-rigid container according to claim 6 further characterized in that the free marginal edges of the container wall panels composed of rigid sheet material adjacent to the projecting marginal tabs of the flexible walls are cut at an oblique angle with respect to the plane of the rigid panel and the marginal tabs are secured to the outer surfaces of said rigid wall panels, whereby the marginal edges are weakened and may be formed by the adjacent flexible walls and their projecting tabs when the flexible sheet material is folded over the weakened marginal edges.

8. A semi-rigid container according to claim 1 further characterized in that two opposed parallel side wall panels of said container are composed of rigid sheet material and each of the remaining walls is composed of flexible sheet material.

9. A semi-rigid container according to claim 8 further characterized in that all of said flexible walls are formed from a single length of flexible sheet material, the adjacent flexible container wall portions being separated only by transverse fold lines in said length of sheet material.

10. In the method of forming a semi-rigid collapsible container consisting of three sheets of material, at least one of which sheets is flexible and at least one of which sheets is rigid, the steps including positioning the corresponding edges of like sheets directly opposite each other in overlapping relationship with the opposed marginal edges of the remaining sheet to form a cross, the rectangular area of intersection of the cross arms defining the bottom wall of said container, bonding together said overlapping edges, displacing said sheets through a series of dies along an axis perpendicular to the surface of said sheets by engaging said sheets with a mandrel having the desired shape of the finished container, which dies wrap the sheets making up said cross arms into contact with the walls of said mandrel and bring tabs on said arms into overlapping relationship with the edges of adjacent arms to form seams, bonding said seams together and removing the container thus produced from said mandrel.

11. A method according to claim 10 further characterized in that a layer of adhesive material is applied to the marginal edge portions of at least one of said sheet materials prior to positioning of said rigid and flexible sheet material in a plane generally in the form of a cross.

12. A method according to claim 10 further characterized in that two portions of rigid sheet material are provided for two opposed parallel side wall panels of said container and a single portion of flexible sheet material is provided for the remaining walls of said container, fold lines are embossed in the surface of said flexible sheet material and adhesive is applied to the marginal edges thereof prior to positioning of said portions of rigid sheet material in a plane on opposite edges of said flexible sheet material.

13. A method according to claim 10 further characterized in that the edges of the rigid container walls are secured to adjacent edges of the flexible walls by means of an infolded marginal edge tab formed in the flexible sheet material and adhesively secured to the marginal edge of an adjacent rigid wall panel.

14. A method according to claim 13 further characterized in that the free marginal edges of the rigid sheet portions adjacent to the projecting marginal tabs of the flexible sheet material are cut at an oblique angle with respect to the plane of the rigid panels whereby the marginal edges of the rigid panels are weakened and are made to conform to the adjacent flexible container wall portions and their projecting tabs.

15. A method of making a semi-rigid container accord-

ing to claim 1 which method comprises providing at least one and no more than two portions of rigid sheet material for at least two and no more than four of the walls of said container and providing at least one and no more than two portions of relatively thin flexible sheet material for the remaining walls of said container, positioning said rigid and flexible sheet material in a plane generally in the form of a cross, the respective opposed pairs of cross arms of said cross being composed of like material and the rectangular area of intersection of said cross arms defining the bottom wall of said container, securing the edges of said rigid sheet material adjacent to the bottom wall area to the edges of said flexible sheet adjacent to the bottom wall area by means of a marginal edge tab of one wall secured to the marginal edge of an immediately adjacent wall composed of different material, providing the portions of said flexible sheet immediately adjacent to said bottom wall area with a pair of embossed oblique bellows fold lines immediately adjacent to said bottom wall area, providing said bottom wall area and portions of said flexible sheet adjacent thereto with a central fold line extending through the apices formed by said bellows fold lines and extending the length of said portions of flexible sheet, forming the thusly composed container blank generally into the shape of a rectangular parallelepiped open at one end and securing together the edges of said rigid container walls to adjacent edges of the flexible walls by means of an infolded marginal edge tab of one wall secured to the marginal edge of an adjacent wall composed of different material.

16. A method according to claim 15 further characterized in that a layer of adhesive material is applied to the marginal edge portions of at least one of said sheet materials prior to positioning of said rigid and flexible sheet material in a plane generally in the form of a cross.

17. A method according to claim 15 further characterized in that the container blank is formed into a container by folding the cross arm portions of the composite container blank upwardly from the area of intersection of said cross arms defining the bottom wall of the container and thereafter securing together the edges of the rigid container walls to the adjacent edges of the flexible walls.

18. A method according to claim 15 further characterized in that two portions of rigid sheet material are provided for two opposed parallel side wall panels of said container and a single portion of flexible sheet material is provided for the remaining walls of said container, fold lines are embossed in the surface of said flexible sheet material and adhesive is applied to the marginal edges thereof prior to positioning of said portions of rigid sheet material in a plane on opposite edges of said flexible sheet material.

19. A method according to claim 15 further characterized in that the edges of the rigid container walls are secured to adjacent edges of the flexible walls by means of an infolded marginal edge tab formed in the flexible sheet material and adhesively secured to the marginal edge of an adjacent rigid wall panel.

20. A method according to claim 19 further characterized in that the free marginal edges of the rigid sheet portions adjacent to the projecting marginal tabs of the flexible sheet material are cut at an oblique angle with respect to the plane of the rigid panels whereby the marginal edges of the rigid panels are weakened and are made to conform to the adjacent flexible container wall portions and their projecting tabs.

21. In the method of forming a semi-rigid collapsible container consisting of three sheets of material, at least one of which sheets is flexible and at least one of which sheets is rigid, the steps including positioning the corresponding edges of like sheets directly opposite each other in overlapping relationship with the opposed marginal edges of the remaining sheet to form a cross, the rectangular area of intersection of the cross arms defining the bottom wall of said container, bonding together said overlapping edges, folding said sheets along the edges of and perpendicular to said bottom wall, simultaneously folding the edges of said cross arms into overlapping relationship with the edges of adjacent arms to form seams, and bonding said seams together to form the container.

22. A method according to claim 21 further characterized in that a layer of adhesive material is applied to the marginal edge portions of at least one of said sheet materials prior to positioning of said rigid and flexible sheet material in a plane generally in the form of a cross.

23. A method according to claim 21 further characterized in that two portions of rigid sheet material are provided for two opposed parallel side wall panels of said container and a single portion of flexible sheet material is provided for the remaining walls of said container, fold lines are embossed in the surface of said flexible sheet material and adhesive is applied to the marginal edges thereof prior to positioning of said portions of rigid sheet material in a plane on opposite edges of said flexible sheet material.

24. A method according to claim 21 further characterized in that the edges of the rigid container walls are secured to adjacent edges of the flexible walls by means of an infolded marginal edge tab formed in the flexible sheet material and adhesively secured to the marginal edge of an adjacent rigid wall panel.

25. A method according to claim 24 further characterized in that the free marginal edges of the rigid sheet portions adjacent to the projecting marginal tabs of the flexible sheet material are cut at an oblique angle with respect to the plane of the rigid panels whereby the marginal edges of the rigid panels are weakened and are made to conform to the adjacent flexible container wall portions and their projecting tabs.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,074,617 January 22, 1963

Harold V. Kindseth et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 42, for "is" read -- it --; column 6, line 12, for "corners" read -- corner --; line 13, for "passed" read -- pasted --.

Signed and sealed this 20th day of August 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents