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ABSTRACT OF THE DISCLOSURE

A low-cost container blank of plastics material is formed and erected to a materials-enclosing container by the steps of: (1) forming by extruding or blow-molding a tubular blank preform member having at least a side wall, an open end and a closed arcuate end edge opposite to said open end. The closed arcuate edge is formed at the termination of the side wall at the initial stage of formation while the plastics material is in a workable state; (2) cooling to harden the blank preform member; (3) flattening the cooled preform member by urging opposed portions of the side wall toward each other by oppositely directed pivoting movements about the closed arcuate edge of the member; (4) retaining the urged side wall portions in a flattened condition by forming first and second vertical foldlines through the length of the preform. Each foldline has ends intersecting the ends of the closed arcuate edge; (5) scoring the outer broad surfaces of the preform with a plurality of foldlines to form a flat container blank. The foldline pattern preferably divides the blank into top, side and bottom panels; and (6) selectively folding the panels to form a fluid-tight container having a seamless bottom construction.

This is a division of application Ser. No. 349,086, filed Apr. 5, 1966, now Patent No. 3,506,692, issued July 2, 1968, for "High-Strength Container and Container Blanks."

This invention relates to the packaging of materials and, more particularly, to a seamless bottomed container constructed of plastics material or the like and foldable from a flat blank to an upright configuration of square or rectangular cross section for packaging of foods and, such as milk.

The object of the present invention is to provide a low-cost container blank by the method of forming and erecting the blank to a fluid-tight container using a seamless and high-strength bottom construction in the initial, as well as final, steps of the formation of the blank. The container blank is foldable from the blank to a fluid-tight container of rectangular or square cross section without sealing mating edges along the bottom of the container. With the container blank of the present invention, it is now possible to produce an inventory of blanks at a centralized location. The completed container made from the blank may be handled with ease by a skilled worker.

Various aspects of the present invention include the method of manufacturing the container blank and erecting the blank to a completed container, as well as the apparatus aspects of the blank and container resulting from the method of the present invention.

Materials have been proposed for constructing these containers totally from plastics to avoid the need for a separate plastic sealant on the exterior of the container, to obtain more consistently good seals on bottoms, and to improve impact resistance and strength. However, several problems have arisen in the use of these polyethylene and polypropylene processing plants. For this reason, this invention proposes a plastic container and the apparatus aspects of the blank and container resulting from the method of the present invention.
through the length of the preform. Each foldline has ends intersecting the ends of the closed arcuate edge; (5) scoring the process stages of the preform with a plurality of foldlines to form a flat container blank. The foldline pattern preferably divides the blank into top, side and bottom panels; and (6) selectively folding the panels to form a fluid-tight container having a seamless bottom construction. In forming the container of the present invention, the side walls are formed by applying uniformly controlled pressure inwardly toward the geometric center along the vertical retainer foldlines. Controllable pressure is also applied along the first arcuate edge at the bottom of the blank to form the bottom panels into a reentranently oriented central bottom member terminating at its ends in double-ply bottom tack-up panels. The tack-up panels are rotatable about the plane of attachment to the side panels for controlled attachment within the reentrant cavity of the central member.

Among the advantages of the resulting container blank and container are: (1) a low-silhouetted container blank convenient for stacking and storing at a centralized location and for transporting to any remote processing location; (2) a fluid-tight container in which critical sealing of the bottom is completed at the manufacturing site; and (3) a stable fluid-tight container in which the reentrant base provides an internal surface on which the compressive forces of the materials can be exerted without outwardly deforming below its plane of contact with a support surface.

Additional features and advantages of the present invention will become apparent from the following specification and accompanying drawings, in which:

FIGURE 1 is an elevational view of a process line for forming, in sequence, the blank preform members and the container blanks of the present invention;

FIGURES 2, 3 and 4 illustrate a preferred embodiment of the preform blank members of the present invention;

FIGURES 5 and 6 illustrate a preferred embodiment of a processed preform blank of the present invention;

FIGURES 7, 8 and 9 illustrate a preferred form of the container blank of the present invention;

FIGURE 10 is a front elevation of the completed container;

FIGURE 11 is a section of FIGURE 10 taken along line 11–11;

FIGURES 12, 13 and 14 illustrate the formation of the container of FIGURE 11;

FIGURE 15 is a section taken along line 15–15 of FIGURE 14;

FIGURE 16 is a side elevation of a machine for forming the container of FIGURE 11;

FIGURE 17 is a side elevation of the container blank of the present invention;

FIGURES 18, 19 and 20 schematically illustrate the operation of the machine of FIGURE 16;

FIGURES 21 and 22 are alternative views of the bottoms of the completed container, with FIGURE 22 illustrating an alternative score pattern; and

FIGURES 23 and 24 are front and rear elevation views, slightly enlarged, of the container blank of FIGURES 7 and 8.

Referring now to the FIGURES, particularly FIGURE 1, it is seen that an extruder 10 includes a hopper 11 of pelletized plastics material and the necessary equipment for heating the plastics material to a soft, workable state for forming an array of blank preform members 12. The extruder 10 is seen to be aligned with other process equipment at the right of FIGURE 1, such as cutting and rolling assembly 16, scoring assembly 17 and stacking and casing assembly 18, for further forming—in sequential process stages—the blank preform member 12 into stacked container blanks 15 as explained below. It is to be noted that the container blanks 15 are illustrated as the product of a blow molding process; however, an extrusion process could be substituted without departing from the intended scope of the present invention.

To form the array of blank preforms 12, a molding system 19 is operatively connected to the extruder 10; and, as indicated, a plurality of molds 20 maintained at the periphery of rotating wheel 21 are sequentially filled with the plastics material after such material has been heated and passed through individual dies 23 to provide a soft parison 22. Preferably the molds are hinged along a side coextensive with the axis of symmetry thereof; each mold half 20a thus may pivot into contact with mating stationary mold half 20b along axes aligned with each other and with the parison 22. To close the molds, suitable operators, such as air cylinders 24, are operated in sequence by means of a central pneumatic registry control system located in the center of the molding system 19. The molds being closed at a rate controlled in accordance with the other processing steps of the present invention. As previously mentioned, parison 22 is initially formed by dies 23 of extruder 10; but, as each mold is closed by the air cylinders 24, the ends of a length of parison are trapped and sealed together within the mold. Simultaneously, a hollow blow needle (not shown) is positioned within the mold and adapted to protrude into and to penetrate the parison. Air is then introduced to expand the parison into contact with the walls of the mold where freezing of the parison occurs. Inasmuch as the process is continuous, the rate of the extrusion of the parison is preferably controlled so that the untrapped portion of the parison exterior of the molds is not severed as the mold closes but forms a continuous web 12b between the emerging array of preformed blanks 12. Water and/or air are also supplied to each mold after the blowing operation is completed, as from rotary distributors at the wheel 21, for cooling the mold and preformed blanks.

When emerging from the plurality of molds 20, the array of blank preform members 12 have a characteristic orientation suitable for further processing steps in accordance with the method aspects of the present invention. For example, as shown in FIGURES 2, 3, and 4, each blank preform 12 is a closed-ended cylinder and includes upper and lower fused edges 29 arcuate with respect to the geometric center of the preform with a continuous side wall formed between these edges. The arcuate edges 29 are formed at the termination of the side wall while the plastics material is in a molten state.

As seen in FIGURE 2, the shape of the side wall varies as a function of distance from the edges 29. It may have a circular cross section at midpoint plane 28; but toward the edges 29, the cross section becomes elliptical. The shape of the outer surface of the side wall is correspondingly affected forming outwardly, but continuously inclined, surfaces 32 (FIGURE 2) and inwardly inclined surfaces 34 (FIGURE 4) which terminate at the arcuate fused edges 29. Although the cross section of the preforms at midpoint plane 28 is shown as circular, other cross sectional shapes can also be used without departing from the intended scope of the present invention. For example, the cross section could be elliptical. Preferably, however, the focal distances of the ellipses defined between the midpoint plane 28 and fused edges 29 increase as a function of distance from plane 28 reaching a maximum at edges 29. The degree of inclination of the surfaces 32 and 34 relative to the longitudinal axis A of each preform is preferably such that the circumference of the preform, measured along any plane normal to the axis A, remains constant throughout the length of the preform. In this manner, later process steps involving severing each preform along midpoint plane 28 and flattening the subdivided preform by pivoting the side wall about the fused edge 29, as by operation of cutting and rolling assembly 16, establishes a container blank of low, flat silhouette suitable for stacking. At the edges 29, there are also found
webs 12a to connect adjacent preforms in an end-to-end array.

Cutting and rolling assembly 16 has flattening rollers 24 preceded in operative sequence by a cutter guide mechanism 25 which: (1) sever the web 12a and cuts each preform along midpoint plane 28, as by means of knives; and (2) correctly align those subdivided preforms with respect to rollers 24, as by means of guide 26.

In the alignment of the preforms, cut edges 27—i.e., edges of the plane 28 as seen in FIGURE 6—are preferably arranged to follow the arcuate fused edge 29 through rollers 24. For such alignment, guide 26 selectively advances those preforms which, at the instant that the preforms are severed along plane 28, lie to the left of the cutters 25, as viewed in FIGURE 1. After alignment by guide 26, the preforms will be oriented so as to pass between the rollers 24 in a horizontal plane of the arcuate edge 29; and, as the movement continues, opposed segments of the side wall of each preform are urged together (flattened) by the rollers. The direction of movement of the opposed segments is inward toward the geometric center of the preform and is pivotally centered about the arcuate edge 29.

The processed blanks emerging from cutting and rolling assembly 16 are shown in detail in FIGURES 5 and 6. Each blank includes vertical foldlines 40 and 41 establishing first and second coextensive side panels 42a and 42b. The shape of lower edge 29 remains arcuate with respect to the geometric center of the preform. It thus includes a positive sloping segment 38 and a negative sloping segment 39. The length of arcuate edge 29 is thus greater than the horizontal distance extending from the intersection of the end of edge 29 with the foldlines 40 and 41. The rate of change of these shapes with distance is preferably, but not necessarily, a similar straight-line relationship across the width of the preform. Thus the segments intersect at a common point—apex 43. Along the upper cutting edges 27 of the article, the side panels are seen to be free to open (see FIGURE 6) as to receive processing tools in later process steps in the fabrication of the container. When formed in the manner just described, the processed blank preforms have a low silhouette and are easily stacked.

Referring again to FIGURE 1, longitudinally spaced from the flattening rollers 24 are first and second main printing rollers 44 mat with back-up rollers 45. The printing unit includes inking mechanism 46 transversely movable relative to the printing rollers, as well as a dryer 47 located adjacent to the inker for drying the ink on the surfaces of the processed preforms.

Still referring to FIGURE 1, scoring assembly 17 scores the articles after they have passed through the printing rollers 44. The scoring assembly 17 basically includes a housing 48 having a base 49 and an input section 50. The input section 50 indexes the incoming blank preforms with the angular displacement of first and second rotating scoring rollers 51 and 52 paired with back-up rollers 53 and 54, respectively, and cut-off roller 55 paired with back-up roller 56. Preferably the first and second scoring rollers 51 and 52 sequentially score sides of the articles 13 with a series of foldlines to form container blanks 15 shown stacked with crates 57. These rollers are preferably of large diameter to score several articles at one time. For scoring, sets of dies having scoring rules or knives are mounted on the circumference of the rollers. As rotation occurs, these rules contact the side panels of each article at the correct time. The back-up rollers 53 and 54 contact the articles from a nonscored side to provide a suitable bearing area. Each container blank 15 (FIGURES 7, 8 and 9) is thus provided with side and end panels clearly defined by a suitable pattern of foldlines.

Remaining pairs of rollers 55 and 56 carry similar arrangements of dies but are of increased height to fully cut the scored preforms along the upper cut edges 27. The scrap material cut by these rollers is immediately withdrawn from the scored preforms. The resulting series of container blanks 15 are thereafter stacked and cased in a convenient fashion as by stacking and bottom assembly 18. Assembly 18 is seen to consist preferably of an input section 58 that gathers the blanks emerging from scoring assembly 17 into a linear array and output section 59 for mechanically and automatically casing the array into the cardboard crates 57. Each crate contains a predetermined number of container blanks 15 for shipment to a more remote filling plant.

Referring now to FIGURES 7 and 8, the score pattern of the container blanks 15 as cased with crates 57 is illustrated. It is seen that each blank is divided by foldlines into a series of panel areas—a central panel area 70, a bottom panel area 71 and a top closure panel area 72—after emerging from scoring assembly 17. These areas are adapted to form the side walls, bottom wall and top closure of the completed container. The areas are defined by upper cut edges 73, more centralised horizontal foldlines 74 and 75, and the lower arcuate edge 29.

As shown in more detail in FIGURES 23 and 24, the central foldlines 74 and 75 are continuous about the front and back sides of each blank. To provide a completed container of square or rectangular cross section, the central area 70 includes vertically extending corner foldlines 76, 77, 78 and 79 that intersect the upper edges 73 and the lower arcuate edge 29. The corner foldlines also intersect the central foldlines 74 and 75. Each corner foldline is parallel to the side wall foldlines 40 and 41 and intersects the horizontal foldlines 74 and 75 to collectively define front, side and back side panels that match front panels 80, 81 and 82 with back panels 83, 84 and 85. In the vertical direction, each of the side panels is in edge contact with the adjacent side panels. A fluid-tight side closure is thus formed continuous about the interior of the blank.

When the vertical corner foldlines 76, 77, 78 and 79 are outwardly folded to form the corners of the container, the side panels are released from contact with one another to form the side walls of the container. As there are six side panels to form four sides, the two non-adjacent pairs of side panels—i.e., panels 80 and 85 end panels 82 and 83—are inwardly folded along the foldlines 40 and 41 until each pair is aligned in a common plane to form a single side wall of the container. Remaining side panels 81 and 84 form the remaining side walls of the container. These panels are formed simultaneously with the movement of the side panels 80, 82, 83 and 85.

Bottom panel area 71 is fashioned into the bottom wall of the completed container. It is connected to the lower edges of the side panels along the transverse foldline 75 to define front and back bottom closure panels that match panels 87, 88 and 89 on the front and panels 90, 91 and 92 on the back. These panels terminate along arcuate edge 29 in an integral engagement to form a fluid-tight sealed seam. The score pattern of the bottom panels differs as indicated in the figures in the following manner; first and second nonadjacent panel pairs comprising panels 87 and 92 and panels 89 and 90 are adapted to engage the panel pairs 88 and 91 along extensions 93, 94, 95 and 96 of the vertical corner foldlines 76, 77, 78 and 79. Bottom panel 87 is also seen to be in vertical edge engagement with panel 92 along a lower segment of vertical foldline 41; similarly, panel 89 has edge engagement with panel 90 along vertical foldline 40.

At an inclined section of each panel 87, 89, 90 and 92 are symmetrically oriented diagonal foldlines 102a, 102b, 103a and 103b which extend between horizontal foldline 75 and arcuate edge 29. Each diagonal foldline has an origin point respectively at the intersection of horizontal foldline 75 with corner foldlines 76, 77, 78 and 79. As indicated, the diagonals of each pair of panels intersect at a common terminating point at the intersection of the vertical foldlines 40 and 41 with arcuate edge 29.

Although the transverse boundaries of the bottom panels are similar to those of the side panels, the primary fold...
direction of the bottom panels is upward toward the geometric center of the container blank. To provide mating corners at the intersection of the bottom wall and side panels, the extension panels 90, 95 and 96 are fanned slightly toward the fold lines 40 and 41. Preferably, but not necessarily, the extensions are perpendicular to the arcuate lower edge 29. It is along these extensions and diagonals 102a, 102b, 103z and 103b that the bottom panels are formed to provide a central transverse support for the complete container. Although the bottom wall of the present invention is formed of these bottom panels, its final orientation substantially differs. Accordingly, separate numerals are used hereinafter to designate the form of the bottom wall and its elements—as, for example, FIGURES 10 and 11 where the bottom wall 97 of the completed container is seen to include a central planar wall 98 and a pair of double-ply tuck-up panels 100 and 101.

The relationship between the bottom wall 97 of the bottom panels of the container blank is best seen by comparing the container of FIGURE 21 with the blank of FIGURES 23 and 24. It can be seen from the figures, the triangular tuck-up panels 100 and 101 are formed of bottom panels bisected by the lower extensions of the vertical foldlines 40 and 41. Specifically, bottom panels 87 and 92 are formed into tuck-up panel 100 by backing along foldlines 102z and 102b. Similarly, tuck-up panel 101 is composed of bottom panels 89 and 90 similarly back-folded as along diagonal foldlines 103z and 103b. Furthermore, the tuck-up panels 100 and 101 are integrally connected to the side panels 80, 82, 83 and 85 along opposed segments of the horizontal foldline 75. The tuck-up panels also connect at their respective ends to the central wall 98—integ rally along the aligned pairs of extension foldlines 93 and 96 and 94 and 95, respectively, as well as separately along their vertices 104 by an adhesive.

On the other hand, the central wall 98 has only a single ply construction composed of bottom panels 88 and 91 coplanarly aligned. These panels connect along arcuate edge 29 to each other; connect to the side panels 81 and 84 along the central segments of foldline 75; and connect to tuck-up panels 100 and 101 along pairs of aligned extension foldlines 93 and 96 and 94 and 95, respectively.

To provide curvature over the central region, the central wall is longer arcuate edge 29 than along central portions of foldline 75 connecting it with the side panels 81 and 84. Initially, the curvature is concave with respect to the horizontal foldline 75, as illustrated in FIGURES 12, 13, 14 and 15. These figures show the blank during its formation at the instant in time after pressure has been applied along vertical foldlines 40 and 41 to cause inward movement of panels 80, 82, 83 and 85 to form pairs of side walls. Thereafter the curvature is reshaped to a convex orientation relative to the geometric center by passing the wall 98 through the plane defined by horizontal foldline 75 to form the container of FIGURES 10 and 11. Among the advantages of the formed reentrant bottom wall is better load-carrying capacity and increased container stability.

A modification of the score pattern of the bottom panels is shown in FIGURE 22 where these panels are provided with downwardly directed, but inwardly converging, foldlines 105a, 105b, 106z and 106z across their central region. These converging foldlines originate from the intersections of the horizontal foldline 75 with the vertical foldlines forming the corners of the side panels. They terminate at a common point—the apex 43 of the arcuate edge 29—to form triangular panels 107, 108, 109, 110, 111 and 112. The resulting triangular panels are selectively folded along the converging foldlines 105a, 105b, 106z and 106z to form the planar blank 98 pyramidal in accord with respect to the geometric center of the blank. The curvature of wall 98 is thereupon reoriented to a convex pyramidal shape by passing the wall through 75 the plane of foldline 75. Tuck-up panels 100' and 101' are formed of panels scored in a pattern similar to that of the previous and side panels but are folded to form their triangular shape as the side walls of the container are formed. The formation of this modified container is completed by folding tuck-up panels 100' and 101' into engagement with the panel wall 98. FIGURE 22 illustrates the formation of the modified container at the time when the wall 98 has been reoriented to a convex contour relative to the geometric center but before the tuck-up panels have been folded into engagement with the central wall 98.

Referring again to FIGURES 23 and 24, at the top of the blank there are a plurality of panel extensions to the completed container a characteristic closure. The closure also provides for a dispensing means for the materials within the completed container—as, for example, a gable-shaped, outwardly flexible spout. It should be noted, however, that other score patterns for the upper panel extension could be used—as, for example, flat-top, fold-over gable shapes—without departing from the intended scope of the invention since the top closure, as illustrated, only indicates a convenient and known way of providing a top closure for the container. To provide the characteristic gable shape, as illustrated, these panels may include foldlines 115' and 116' in the bottom blank. The gable flaps may be scored along foldlines 135 and 136 defined by upwardly directed foldlines 135 and 136 intersecting one another at vertex 137 on the horizontal foldline 114. The remaining roof panels are formed in adjacent pairs—i.e., panels 115 and 120 and panels 117 and 118—to form the side roof panels of the closure. Each pair of side roof panels 115, 117, 118 and 120 is formed by applying inward pressure along the foldlines 40 and 41 causing each pair of panels to pivot about such foldlines until aligned in a common plane. The side roof panels 115 and 117 include upwardly directed foldlines 138 terminating at a vertex 139 on the horizontal foldline 114. Above the horizontal score line 114, ribs 140 of the blank are fashioned from the roof panels 115, 116, 117, 118, 119 and 120 and include a series of inner and outer rib panels, as well as sealing panels forming the ridgepiece of the gable of the finished container. It can be seen that the container can be transformed into a completed container; inwardly directed pressure applied at the roof end panels 116 and 119 may then be used to effect sealing of the top closure.

As previously mentioned, the blank is preferably scored at one location where skilled personnel are available to perform needed supervision of the plastics process. The scored blanks are then usually shipped to another processing station and transformed into a completed container.

Referring now to FIGURE 16, a multistation stationary forming machine 145 may be provided to erect the container blanks 15 into completed containers. It may include a mandrel assembly 146 on which the blanks are loaded for sequential ejection. The mandrel machine rotates by means of an indexing control mechanism (not shown) to various stations about the periphery of the mandrel, with each station forming foldline 75 with the mandrel, including folding of the side and bottom panels of the blanks to form the side walls and bottom of the container and stripping of the formed containers from the mandrel.

Inasmuch as this invention is primarily related to the shape of the bottom closure of the blank, as well as the container, the bottom wall 98 is an integral part of the present invention. For effecting folding of the bottom of the blank into the desired reentrant shape, for example, the mandrel assembly 146
of forming machine 145 may consist of a spider 165 having a plurality of arms 173 rotatable to pass a series of blanks in sequence through the forming operations. Initially, a blank is located on one of the arms of the spider, say at load station 166, is rotated from there to a dwell station 167, then to a fold station 168, and then to a bonding station 169 where adhesive is applied to the bottom to effect sealing of the tuck-up panels 100 and 101 (FIGURE 18) to the outside bottom surface of the container. The assembly may then be indexed through an idler station to stripper station 170 where an air blast strips the container from a mandrel.

In sequence of these operations, the flattened blanks are fed one at a time from a stacker support 171 to a body-forming mechanism 172 which forms the blanks into a container having substantially rectangular or square cross section and then feeds the formed containers onto one of the plurality of arms or mandrels 173. Each mandrel has a rectangular or square cross section similar to that of the container and is formed from several outward radiator spokes whose ends define the figure of a desired cross section. The body-forming mechanism 172 first applies inwardly directed pushing pressure along the plane of the side foldlines 40 and 41 of the blank, as shown in FIGURE 17, thereby pushing the side panels until the side walls of desired cross section are formed. FIGURE 17 schematically illustrates the direction of these pushing forces to form the side walls.

In forming the tuck-up panels 100 and 101, forming pressure is applied along arcuate edge 29 at points M and N of the blank of FIGURE 17 by a pusher mechanism 175 of the forming machine of FIGURE 16, say at fold station 168. The bottom panels thus fold upwardly along the diagonal foldlines at the points of pressure application; e.g., as along diagonals 102a and 103a. The pusher mechanism 175 is controlled by the rotation of the spider to provide downward movement to the tubular container blank onto the mandrel in a direction parallel to the axis of symmetry of the mandrel. Since the blank need not be seamed along its side, only the bottom must be formed to produce a fillable container.

The top is sealed in a separate operation.

As schematically illustrated in FIGURE 18, the plane of alignment of the bottom panels forming the tuck-up panels is changed from a position parallel to the side panels to a position normal thereof.

Forming the bottom to be reentrantly displaced relative to the side walls of the container occurs by applying pressure over the bottom wall of the container, as by a breaker shoe operated by air pressure which can be a part of pusher mechanism 175. As previously noted, the horizontal length of the bottom wall at its center—i.e., along the arcuate edge 29 of the partially completed container of FIGURE 18—is greater than its length along the segments of the foldline connecting the side panels 81 and 84 to the bottom wall. As upward pressure is applied, as at apex 43 as shown in FIGURE 18, the bottom wall pivots and moves upwardly; this movement ceases when the wall is convexly oriented with respect to the geometric center of the container. The tuck-up panels 100 and 101 are then rotated along the direction of arrows 176 and 177 of FIGURE 19 into the cavity formed by the reentrant orientation of the bottom wall of the container by the movement of the same shoe or by a separate tucker on the forming machine of FIGURE 16. The tuck-up panels are then secured, as shown in FIGURE 20, to the outer surfaces of the central bottom wall by a pressure pad 179. Bonding usually occurs at the bonding station 169 of the forming machine. Thereafter, the container is stripped from the mandrel at stripper station 170 and subsequently admitted to a filling machine where the container is filled and the top is closed by assembly operations not shown.

While the embodiment of the present invention as described constitutes preferred forms, other forms may be apparent to those skilled in the art. In this regard, plastics materials useful in the present invention may include those materials solid at room temperatures, such as: aliphatic polyolefins, such as polyethylene and polypropylene; vinyl polymers and copolymers, such as vinyl butyral, vinyl chloride, etc.; and acrylic polymers and copolymers.

We claim:

1. A method of forming a hollow, flat container blank of plastics material or the like having a series of fold-lines dividing said blank into an upper panel area terminating in twin-curt upper edges, a body panel area formed of a series of continuously connected side panels, and a bottom panel area terminating in a seamless fluid-tight lower arcuate edge concave with respect to the geometric center of the blank which comprises the steps of:

   (1) forming a hollow blank preform member having at least a side wall, an open end and a closed arcuate edge opposite said open end, said arcuate edge being concave with respect to the geometric center of the preform member and formed while all of said plastics material is in a workable state;

   (2) cooling to harden said blank preform member;

   (3) urging opposed portions of said side wall inwardly toward a central vertical plane intersecting the axis of symmetry of said preform member and said arcuate edge to flatten said member;

   (4) retaining said urged portions in said flattened state by forming first and second vertical foldlines along said side wall in said vertical plane, said foldlines intersecting said arcuate edges at ends thereof; and

   (5) scoring the outer broad surfaces of said preform member over preselected areas to form a plurality of foldlines across said blank thereby dividing said blank into top, body and bottom panel areas.

2. Method of claim 1 further characterized by the simultaneous performance of steps (3) and (4) thereof.

3. Method of erecting a container for insertion of materials therein in which said container is constructed from a flat, hollow container blank having a series of foldlines dividing said blank into a top panel area terminating in twin-curtubular edges, a body panel area formed of a series of continuously connected flat side panels flattened to form adjacent first and second planar planar walls having parallel and coextensive broad surfaces, integrally terminating in edge engagement with one another along first and second side foldlines lying in a common plane passing through the geometric center of the blank, and a bottom panel area formed of a plurality of bottom panels terminating at a seamless fluid-tight lower arcuate edge concave with respect to said geometric center and also lying in said common plane which comprises the steps of:

   (1) forming four vertical side walls by urging said side panels relative to one another;

   (2) simultaneously urging said bottom panel upwardly toward the geometric center of said blank by applying pressure at said arcuate edge at selected locations whereby selected bottom panels form at least two tuck-up panels and a central panel along the lower edge of said side panels;

   (3) rotating said tuck-up panels about their plane of attachment to said side panels and said central panel until juxtapositionally aligned with said central panel; and

   (4) permanently securing said tuck-up panels to said central panel.

4. Method of claim 3 in which step (2) is further characterized by the application of urging pressure over a preselected location of said central panel to pass said panel through its plane of attachment to said side panels, said urging pressure being so arranged as to cause said central panel to reentrantly protrude within the confines of said side walls.
5. Method of claim 3 in which step (1) is further characterized by applying pressure along preselected locations of said two side fold lines in said common plane passing through said arcuate edge and said center of geometry.

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