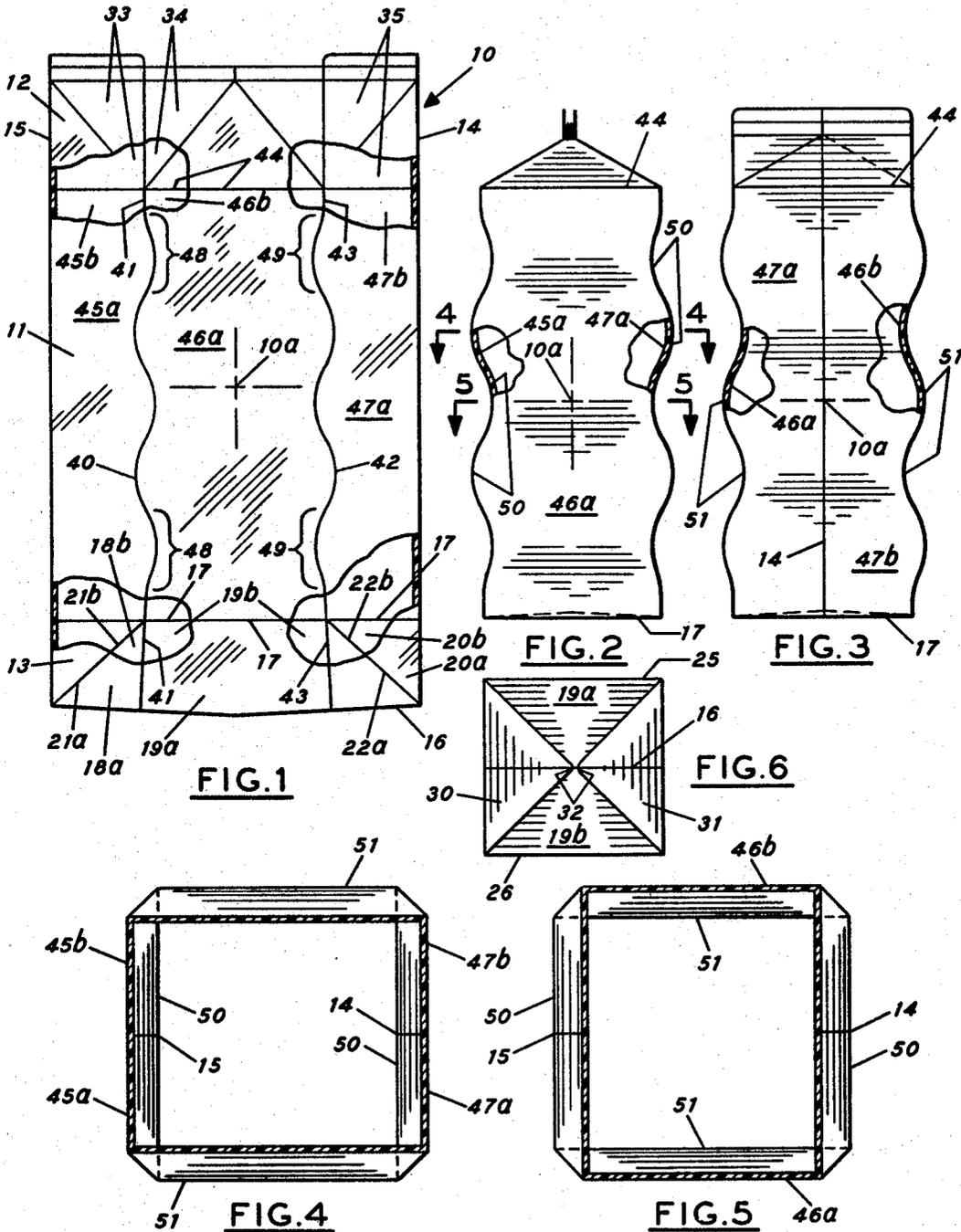


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WALLS THEREOF AND CONTAINER BLANK FOR FORMING SAME
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CONTAINER HAVING A SERIES OF CONVOLUTIONS ALONG THE SIDE WALLS THEREOF AND CONTAINER BLANK FOR FORMING SAME

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ABSTRACT OF THE DISCLOSURE

A container and container blank of plastic material adapted to have a plurality of side panels, the said panels having at least four sinuous foldlines and to straight foldlines; the straight foldlines adapted to allow said blank to be folded flat to form a low silhouette; the sinuous foldlines selectively foldable as the blank is erected to form a series of convolutions along the side walls of the container.

This invention relates to the manufacture of closed containers constructed of plastics materials. It relates more particularly to closed containers foldable from flat container blanks to upright configurations of square or rectangular cross sections for the packaging of liquid materials, such as milk.

Briefly, the primary object of the present invention is to provide side walls of such containers on which a vertical lifting force can be exerted, as during the dispensing of the container contents, without inwardly deforming the side walls toward the center of the container and without complicating the usual score line pattern of the container blanks from which the containers are formed.

In accordance with the present invention, a series of convolutions are formed along the side walls of such containers to provide the diagonally sloping surface area on which a vertical lifting force can be exerted without deforming the side walls of the container. Preferably, the convolutions are periodically disposed along the walls, say every one to two inches, and are provided by an appropriately formed score pattern of foldlines which facilitates the selective folding of the side panels of the container blank from a flat to an undulating orientation.

It is well known in the packaging art to construct container blanks by scoring foldable sheets of cardboard, plastics and the like with a series of foldlines to divide the blank into a series of panel areas. For example, the foldline may be arranged to form a top panel area at the top of the container, a central panel area over the main long section of the blank, and a bottom panel area at the bottom. Usually the foldlines are oriented in straight-line relationships for a variety of reasons. For example, the designer may find straight-line relationships easier to visualize in the initial stages of development of the container blank. It is therefore easier for him to design, in a relatively short time, the container and blank. However, the straight-line foldline patterns of the prior art container blanks produce containers having flat side walls normal to flat bottom walls.

After the container is filled with fluids or solids, these contents are usually dispensed by a person lifting the container by gripping opposed side walls with his hand. The hand pressure must be sufficient to adequately grip the container but must be below the rupture modulus of the plastics material. Accordingly, if the gripping area of the hand is wet or the hand pressure is too great, there is an increased likelihood of the contents spilling from the container. Either the container may slip from the

hand as it is lifted or the side panels may become overstressed with minute tears resulting along segments of the sides or bottom panels of the container.

The present invention, however, provides for the arrangement of the foldlines across a container blank in which the central panel area is provided with a combination of straight and sinuous foldlines that allow selective reorientations of the blank to a finalized container having better gripping characteristics as well as an esthetically enhanced appearance. Briefly, this foldline pattern includes first and second horizontal foldlines which mark the top and bottom boundaries of the central panel area. At vertically spaced intervals, the pattern also includes at least four vertical foldlines marking the corners of the completed container which are formed in sinuous patterns relative to each other. Although preferably the amplitudes of these foldlines are constant and equal, the phase of adjacent foldlines—as viewed on the same side of a flat blank—preferably differs by 180 degrees. Thus as the central panels are inwardly folded along such pair of adjacent foldlines, the series of convolutions formed along any one side wall terminate in edge engagement with oppositely contoured convolutions of the two adjacent side walls. However, on opposed side walls, horizontally aligned convolutions are similarly contoured. Consequently, the convex contour of the convolutions of such side walls provides horizontally aligned gripping surfaces on which the vertical lifting forces, as provided by a person's hand, can be exerted without deforming the side wall of the container.

Other objects and features of the present invention will become more apparent after an examination of the following description of an embodiment of the invention taken in conjunction with the drawings, in which:

FIGURE 1 is an elevational view with partial sections, of a flat blank which is fashioned into a container of the present invention;

FIGURE 2 is an elevational view, with partial sections, of the container of the present invention;

FIGURE 3 is a side view, with partial sections, of the container of the present invention;

FIGURE 4 is a sectional view taken along line 4—4 of FIGURE 2;

FIGURE 5 is a sectional view taken along line 5—5 of FIGURE 2; and

FIGURE 6 is a bottom view of the container of the present invention.

Referring now to the drawings, particularly FIGURE 1, container blank 10 is fashioned with a series of foldlines dividing the blank into a plurality of panel areas. When folded, usually toward the geometric center 10a of the blank. These panel areas form a completed container of square or rectangular cross section.

As indicated in FIGURE 1, the blank 10 includes a central panel area 11 which is fashioned to the side walls or body portion of the container, upper panel area 12 which forms the top closure of the container and lower panel area 13 which forms the bottom of the container. The rear sides of the panel areas 11, 12 and 13 are illustrated in FIGURE 1; the rear side is identical in pattern to the foldlines as illustrated. The near and remote sides integrally connect to each other along vertical foldlines 14 and 15 which allow the blank to lie flat in a common plane, as defined by lower primary foldline 16 at the lower edge of the blank.

Bottom panel area 13 is defined between upper horizontal foldline 17 and primary foldline 16 and includes pairs of bottom panels 18a, 18b, 19a, 19b, 20a and 20b, each of said pairs being integrally connected along primary foldline 16. At the vertical side edges, each bottom panel is seen to be in integral edge engagement with adjacent panels along the lower vertical extensions of

vertical foldlines 40, 41, 42 and 43 or along the bottom portions of previously mentioned foldlines 14 and 15 to provide a seamless bottom construction as described in more detail in a copending application assigned to the assignee of the present application ("High-Strength Container and Container Blank Having Seamless Bottom Walls, and Method of Forming Same," Ser. No. 549,086 filed Apr. 5, 1966, Howard S. Malby, Fred M. Recknagel and Roger S. Tobie).

Briefly, at each end of the panel pairs 18a, 18b, 20a and 20b, diagonal foldlines 21a, 21b, 22a and 22b divide the panel pairs into a plurality of right triangular elements. The container blank is thus adapted to be folded at the diagonal foldlines 21a, 21b, 22a and 22b as pressure is applied along foldlines 14 and 15, to form these elements into a pair of twin-thickness tuck-up panels 30 and 31, as shown in FIGURE 6. As illustrated, the tuck-up panels are triangularly shaped and conveniently attached at vertices 32 to the exterior surfaces of the bottom panels 19a and 19b. At the attaching surfaces, the bottom panels 19a and 19b are not formed in a common plane normal to the side walls of the container, but are reentrantly shaped with respect thereto. For this purpose, the primary foldline 16 of the blank is formed such that it slopes diagonally across the blank. Accordingly, its length dimension is greater than that of edges 25 and 26 of these panels. Relative movement of the panels by pivoting about primary foldline 16 reorients them with respect to the center of the container.

Upper panel area 12 is at the top of the blank formed of a plurality of pairs of panel extensions 33, 34 and 35 inwardly foldable to provide a closure area and a dispensing spout for the container. These extensions give the completed container a characteristic closure as, for example, a gable shape having an outwardly flexible spout well known in the art.

Central area 11 is fashioned to form the side walls of the completed container and comprises a series of contiguous side panels 45a, 45b, 46a, 46b, 47a and 47b defined by four vertical foldlines 40, 41, 42 and 43 and the previously mentioned exterior foldlines 14 and 15. The side panels 45a and 45b, as well as panels 47a and 47b, are longitudinally divided by the vertical foldlines 14 and 15 which allow, as previously indicated, the blank to be folded flat to a low silhouette. However, side panels 46a and 46b are unmarked in this regard. Each of these side panels 45a, 45b, 46a, 46b, 47a and 47b, however, is contiguously attached to adjacent panels to form a fluid-tight enclosure along respective foldlines 40, 41, 42 and 43. In the horizontal direction, these panels are defined between foldline 44 at the upper boundary and by foldline 17 at the lower boundary.

Foldlines 40, 41, 42 and 43 serpentine periodically about imaginary straight lines extending vertically along the central area 11. The ends of the foldlines terminate in contact with horizontal foldlines 44 and 17.

The amplitude of the foldlines 40, 41, 42 and 43 relative to these imaginary lines are maximum where the slopes of the foldlines are zero (i.e., at the peaks and valleys) and minimum where the foldlines cross the imaginary lines. Although the magnitude of the foldline amplitude periodically changes as a function of the length of the foldlines, the absolute range of such variation is a constant.

In any horizontal plane normal to the axis of symmetry of the blank, however, the variation in the amplitudes of the two horizontally aligned foldlines (i.e., foldlines in the same plane as the broad surfaces of the blank) are not the same but instead are inversely related. Thus the phase of the foldlines 40 and 41 is the inverse conjugate of that of the foldlines 42 and 43; or, in other words, there is a phase difference of 180 degrees between these foldlines. Accordingly, the half cycles of the foldlines 40 and 41 at the intersection with the horizontal foldlines 44 or 17 form convexly contoured wavelets

48 relative to the geometric center 10a of the blank. Horizontally aligned across the blank, the opposing foldlines 42 and 43 are inversely arranged relative to foldlines 40 and 41 and are such that concavely contoured wavelets 49 are formed at the intersection with horizontal foldlines 44 and 17. The reason for the inverse relationship of the foldlines is explained below.

Pivoting side panels 45a, 45b, 47a and 47b about foldlines 14 and 15 form these panels into side walls normal to the side panels 46a and 46b. For this purpose, pressure is inwardly applied toward the geometric center 10a of the blank along the entire length of the foldlines 14 and 15. Panels 46a and 46b also pivot relative to the panels 45a, 45b, 47a and 47b at the vertical corner foldlines 40, 41, 42 and 43 as such pressure is applied. After the pressure is released, the central areas of the panels are no longer flat, but are fashioned, as viewed in FIGURES 2 and 3, into a series of convolutions. As indicated, the contour of the convolutions of adjacent side walls differs. Accordingly, the numeral 50 is used to designate similarly oriented convolutions on opposed panels 45a, 45b, 47a and 47b (FIGURE 4) while the numeral 51 is used to indicate convolutions on opposed panels 46a and 46b (FIGURE 5).

As indicated in FIGURES 2 and 3, the contour of convolutions varies in accordance with the pattern of the foldlines from which the convolutions are formed. Accordingly, in similar horizontal planes, opposing convolutions of the side walls have similar contours, while adjacently located convolutions have inversely oriented contours. For example, between the horizontal planes along lines 4—4 and 5—5 of FIGURE 2, convolutions 50 are seen to be inwardly directed toward the geometric center 10a—i.e., convexly oriented relative to center 10a—while, for the same horizontal planes projected into FIGURE 3, the convolutions 51 of panels 46a and 46b are outwardly directed relative to the center 10a—i.e., concave relative to the center 10a. In a similar manner, the horizontal distances extending between the interior surface of the opposed convolutions may vary from a maximum in the apexes of the concave convolutions to a minimum at the troughs of the convex convolutions (FIGURES 4 and 5). In that manner, the container may be lifted to dispense the contents by inserting the fingers and thumb of the hand on the convex surface of the convolutions on opposed side panels to provide a vertical lifting force to the container without inwardly deforming its side walls.

These and other advantages are obtainable when operating in accordance with the foregoing embodiment of the invention or with any of numerous variations that could be made by those skilled in the art without departing from the spirit of the invention; and all such variations that fall within the scope of the appended claims are intended to be embraced thereby.

We claim:

1. A materials-enclosure container of plastics material or the like fashioned from a flat container blank having a series of foldlines dividing said blank into at least a side panel area of a plurality of side panels integrally joined together along vertically extending edges to form a fluid-tight side closure area, comprising a body member having four coextensive continuous side walls, two opposed side walls with respect to the geometric center of said container being provided with coplanar straight vertically extending foldlines adapted to allow folding therealong so as to provide a flat container blank prior to erection to form said container, each of said side walls integrally engaging two adjacent side walls along vertical edges thereof, and having a series of convolutions therealong extending directionally across the full transverse dimension of said side wall, said convolutions including periodically spaced-apart sections convexly and concavely contoured with respect to said geometric center of said container to cooperatively provide a series of horizontally aligned gripping areas in which lifting forces can be exerted to dis-

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pense material from said container and to add strength along said two opposed side walls provided with said coplanar straight vertical foldlines, a top closure engaging the upper edge of said body member, and bottom means in operative engagement with the lower edge of said body member to form a fluid-tight container.

2. Said container of claim 1 in which each convolution of said series of convolutions joins in edge engagement with an oppositely contoured convolution of said adjacent side wall.

3. Said container of claim 1 in which said bottom means comprises a seamless bottom wall integrally and continuously engaging a lower edge of said body member along a horizontal continuous foldline.

4. A container blank to form a materials-enclosing container of rectangular or square cross section formed of plastics material or the like in which a series of foldlines divides said blank into foldable panel areas, comprising a plurality of top closure panels, a plurality of side panels attached to said top closure panels along a first horizontal foldline, and a plurality of bottom panels attached to said side panels as extensions thereof along a second horizontal foldline, said plurality of side panels having four vertically directed sinuous foldlines adapted to form corners of said container and two vertically directed straight coplanar foldlines adapted to allow said blank to be folded flat therealong to form a low silhouette, said sinuous foldlines and said straight foldlines adapted to allow said side panels defined thereby to form a continuous fluid-tight side closure area, each of said sinuous

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foldlines being so constructed and attached to allow said side panels defined thereby to be selectively folded to form a series of convolutions therealong when said side panels are folded to form said container.

5. Said container blank of claim 4 in which a pair of said vertically directed sinuous foldlines is an inverse conjugate of the remaining pair of said foldlines.

6. Said container blank of claim 4 in which each of said bottom panels has at least one terminating edge in an integral engagement with a terminating edge of another of said bottom panels to form a fluid-tight bottom closure area.

7. Said container blank of claim 6 in which said fluid-tight bottom closure area includes a remote primary edge in coplanar alignment with at least said two opposed straight vertical foldlines of said side panels to thereby place opposed broad surfaces of said side, top and bottom panels in a juxtapositional relationship and form said flat container blank of low silhouette.

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DONALD F. NORTON, *Primary Examiner.*