May 16, 1939. O. W. WENTZ 2,158,097

CONTAINER CONSTRUCTION

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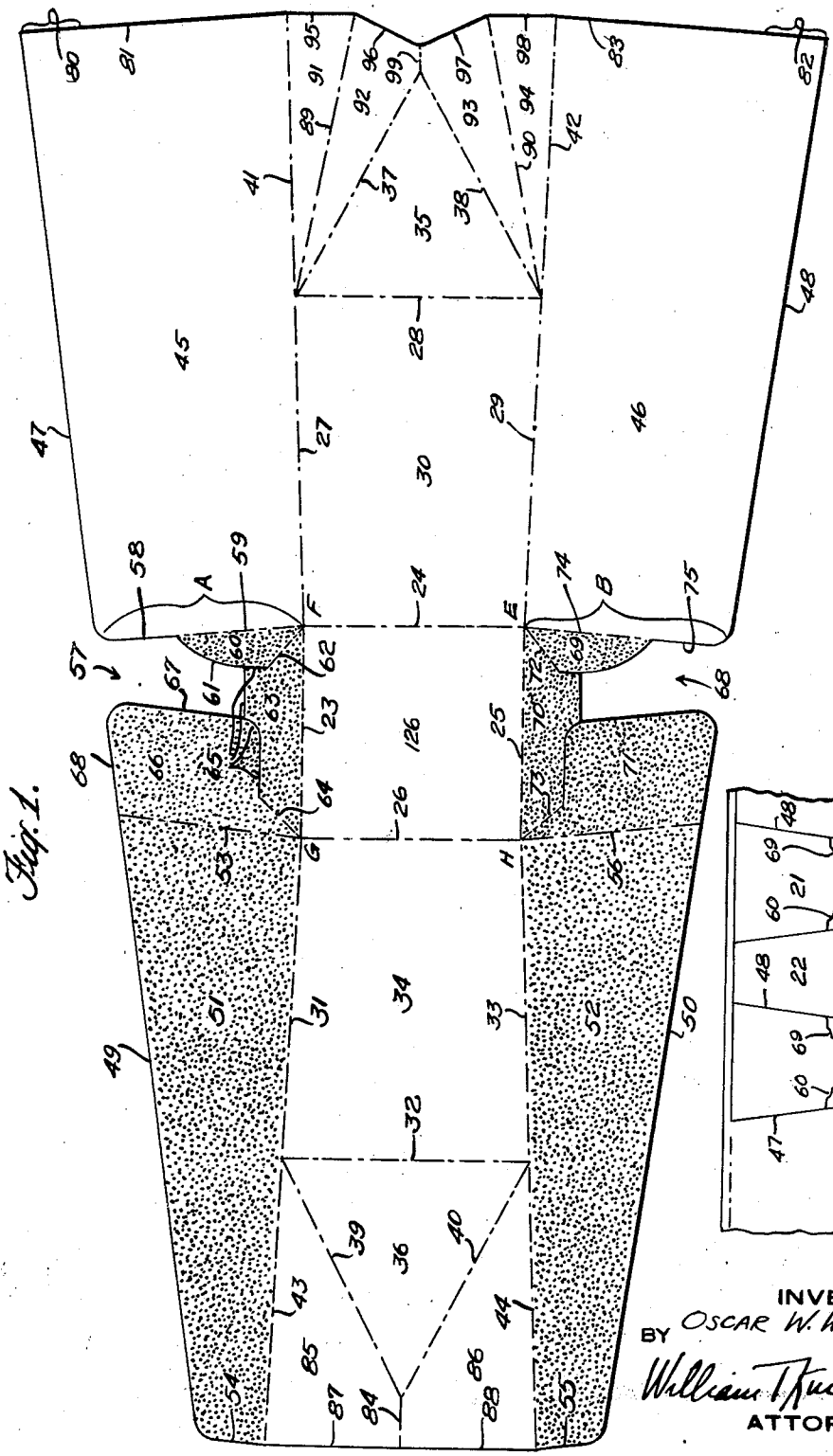


Fig. 1.

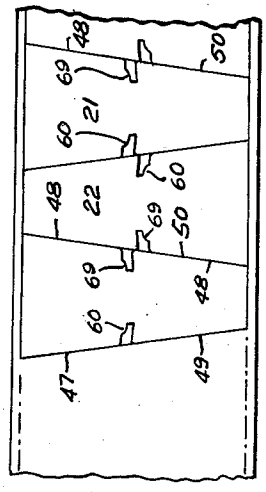


Fig. 2.

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CONTAINER CONSTRUCTION

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Fig. 3.

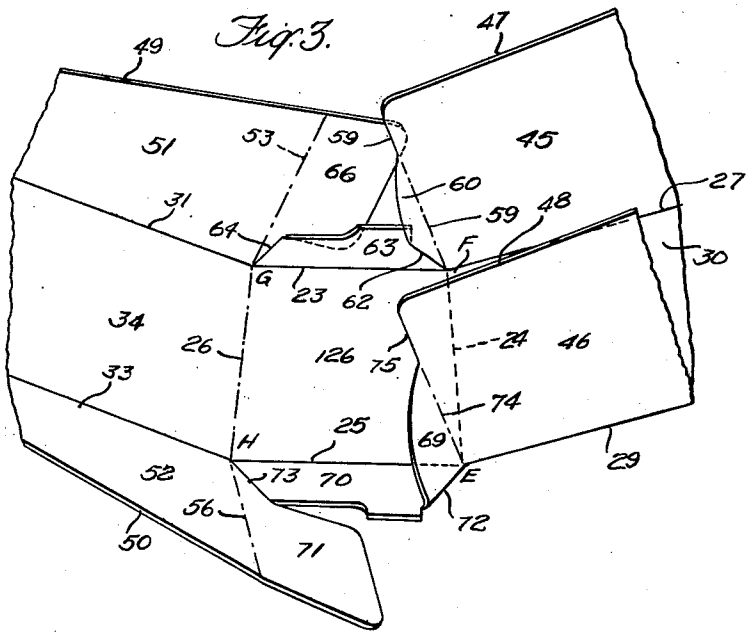


Fig. 4.

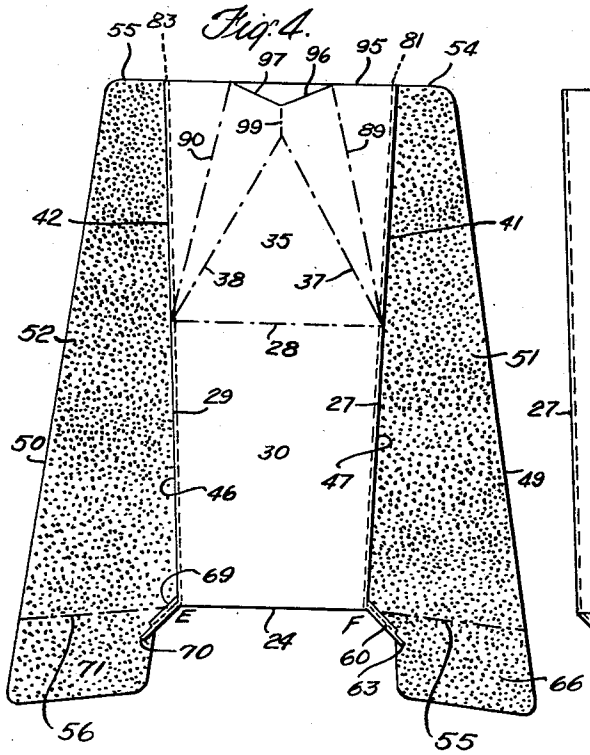


Fig. 5.

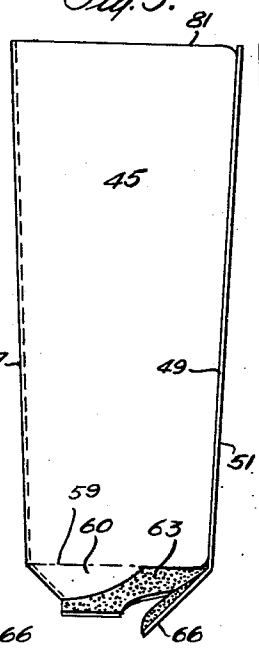
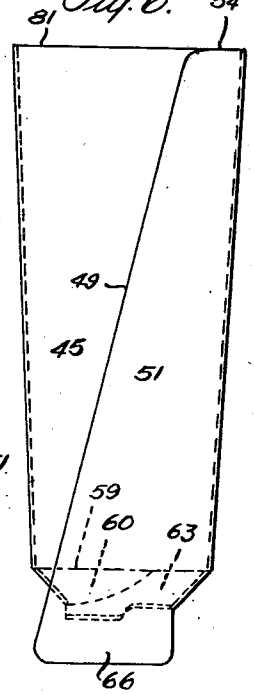


Fig. 6.



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Fig. 7.

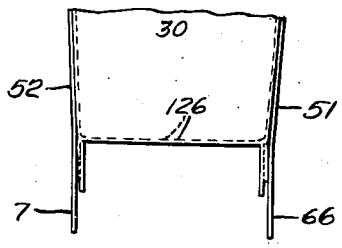


Fig. 8.

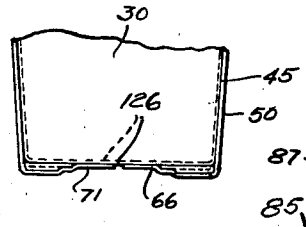
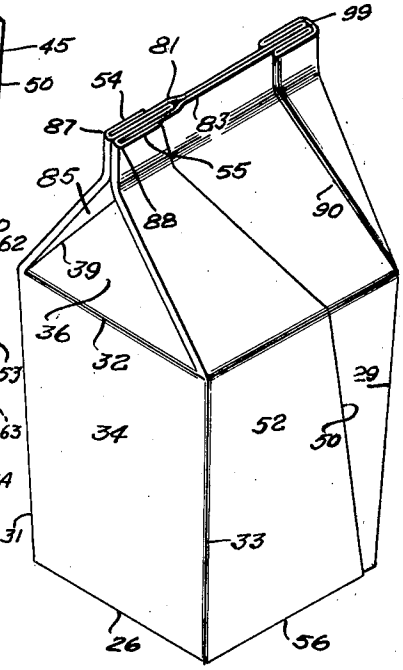


Fig. 11.



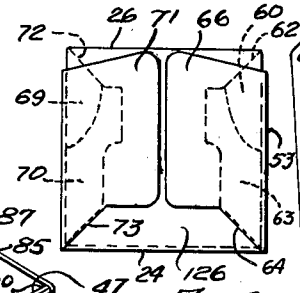
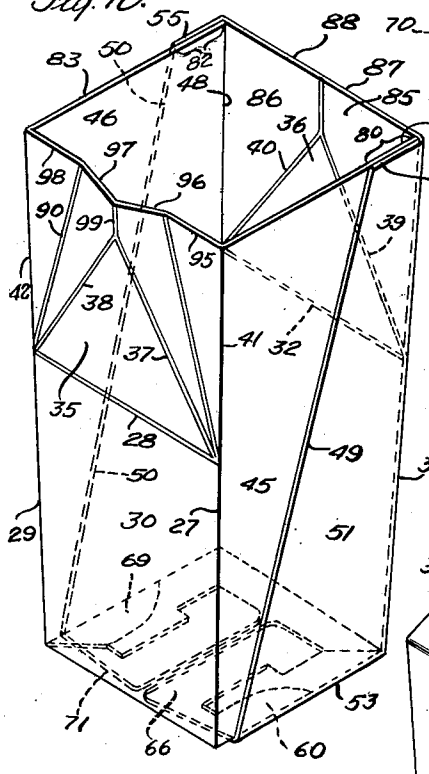


Fig. 9.

Fig. 10.



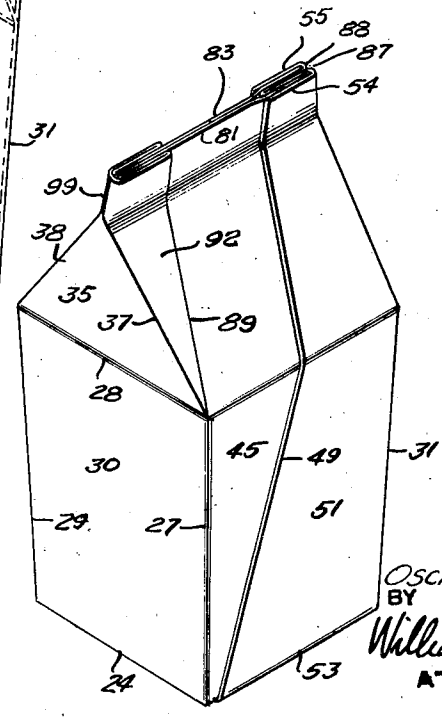


Fig. 12.

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CONTAINER CONSTRUCTION

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Fig. 13.

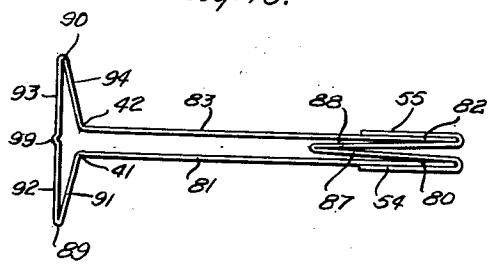


Fig. 14.

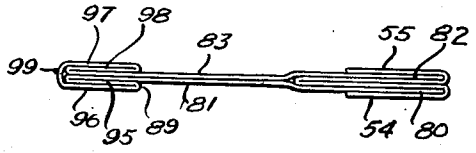


Fig. 15.

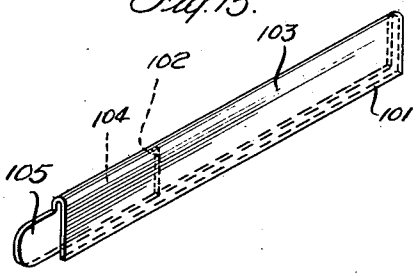


Fig. 18.

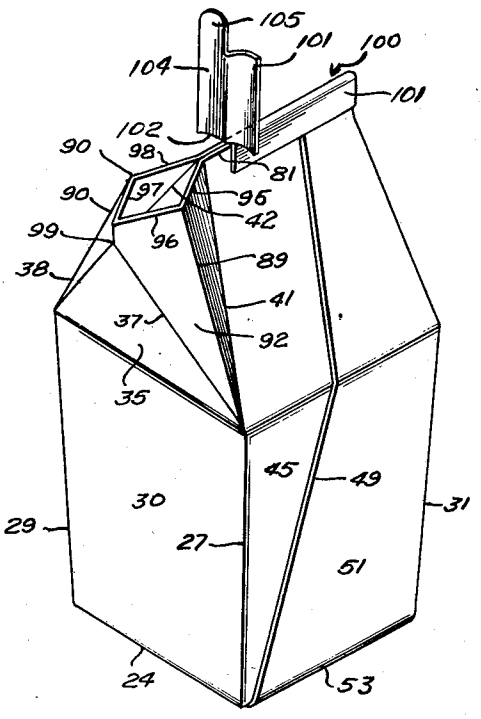


Fig. 16.

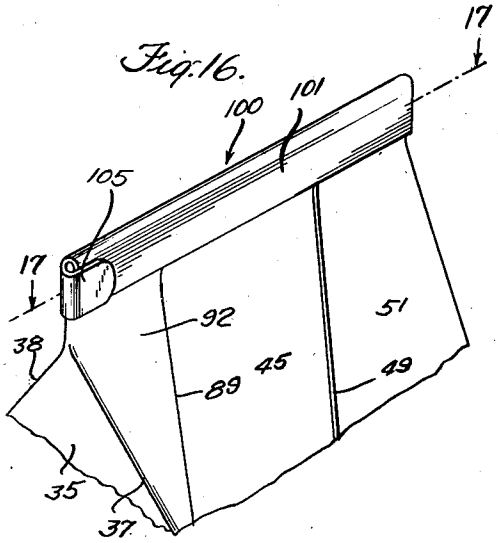
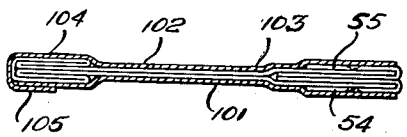


Fig. 17.



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Patented May 16, 1939 2,158,097

UNITED STATES PATENT OFFICE

2,158,097

CONTAINER CONSTRUCTION

Oscar W. Wentz, Long Island City, N. Y.

Application December 19, 1936, Serial No. 116,782

16 Claims. (Cl. 229—17)

This invention relates to container construction and more particularly to a liquid-proof container of paper or the like and to a method of enclosing and sealing liquids in paper material.

One of the objects of this invention is to provide an inexpensive, dependable and strong sealed enclosure for containing liquids, and the like, but made of a fibrous foldable sheet material like paper, cardboard, or the like. Another object is to provide a container construction of the above-mentioned character in which efficient use of the paper stock may be made, thus to effect reduction of waste while at the same time so to shape the blank that, when folded to form a closed container or enclosure for the liquid, the various parts of the container, such as the top and bottom closures and intervening sides, are mutually reinforcing, thereby to permit the use of lighter or thinner paper stock, thus further to reduce the cost, and to achieve greater mechanical strength and rigidity. Another object is to provide a container construction of the above-mentioned character in which, without detracting from the achievement of the above-mentioned objects, one of the closures may be efficiently and dependably shaped to provide, when unfolded, a discharge or pouring spout. Another object is to provide, in a container construction of the above-mentioned character certain structural features that can function as a convenient hand grip when the pouring spout is made to function.

Another object is to provide a container construction of the above-mentioned character in which bulging of the sides, due to the hydrostatic head of liquid carried therein, is dependably and inexpensively prevented without having to increase the weight or thickness of the paper stock employed. Another object is to achieve, in a container construction of the above-mentioned character, such a dependable yet simple and inexpensive mechanical interrelation between the top and bottom closures that distortion of the container, as by strains created when the filled container is carried by the top closure or by strains tending to crush the container along its vertical axis, is dependably prevented. Another object is to provide a paper container, capable of carrying and having sealed therein liquids, illustratively milk, that will dependably withstand the hazards of handling, such as in milk deliveries, and the like, and particularly such mechanical hazards as the dropping of the container, irrespective of which part of the container contacts the ground or other object, when dropped. Another object is to provide a simple, inexpensive and dependable method of constructing and sealing containers of the above-mentioned character and one that may be inexpensively and efficiently carried on in practice. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts and in the several steps and relation and order of each of the same to one or more of the others, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which are shown by way of illustration a preferred embodiment of the mechanical features of my invention and a preferred sequence of steps diagrammatically shown,

Figure 1 is a plan view or development of the shape or outline and of the scoring of a paper blank out of which I may make my container;

Figure 2 is a fragmentary plan view on a small scale showing how the blank of Figure 1 may be cut out of paper stock;

Figure 3 is a perspective view showing certain initial bending or folding operations performed on the blank of Figure 1;

Figure 4 is an end elevation as it would be seen from the right in Figure 3 after the completion of certain of the folding movements indicated in Figure 3;

Figure 5 is an end elevation, as seen from the right in Figure 4;

Figure 6 is a similar end elevation but showing the completion of a succeeding folding operation;

Figure 7 is an end elevation as seen from the left in Figure 6;

Figure 8 is an elevation like that of Figure 7 but showing the completion of certain succeeding folding operations;

Figure 9 is a view as seen from the bottom in Figure 8;

Figure 10 is a perspective view of the container in the condition in which it appears in Figures 8 and 9;

Figure 11 is a perspective view of the container closed when viewed from one end;

Figure 12 is a similar view as seen from the opposite end;

Figures 13 and 14 are detached plan views of the container mouth in successive stages of closing;

Figure 15 is a perspective view of a clamp;

Figure 16 is a perspective view of the container with clamp applied;

Figure 17 is a section on the line 17—17 of Figure 16, and

Figure 18 is a perspective view of the container with a portion of its mouth open.

Similar reference characters refer to similar parts throughout the several views in the drawings.

Referring first to Figure 1, the container is preferably made of a single piece or blank of suitable sheet material, such as paper, cardboard, or other appropriate fibrous or cellulose material; for convenience, and not by way of limitation, the material employed will be termed "paper". The blank is, for purposes later described, preferably shaped to be bounded by two substantially parallel lines and by two lines inclined to each other, preferably broken as later set forth, and thus in general the blank has a trapezoidal shape. Aside from thereby achieving structural features and advantages in the container, this shape of blank makes it possible to achieve maximum efficiency in utilization of paper stock, as is indicated in Figure 2, where the paper stock 20 may be assumed to be of a width which is an appropriate multiple of the longest dimension of the blank, illustratively in Figure 1 substantially equal to that dimension; accordingly, the dies for cutting the blank of Figure 1 may be so arranged that alternate blanks cut out of the stock 20 are reversed end-for-end, as is clear from a consideration of the two blanks 21 and 22 outlined on the paper stock 20 of Figure 2. Thus, there is substantially no wastage of paper, excepting for the very small cutouts which, however, fall within the area of the trapezoidal blank itself.

The blank of Figure 1 is scored along the lines where folds are to take place and it is also cut and cut out to provide certain flaps and for purposes of illustration it has been assumed that the container is to have a horizontal cross-section that is rectangular and that the container is otherwise to be tapered so as to permit nesting of still-open containers. Accordingly, the blank of Figure 1 is scored along the lines 23, 24, 25 and 26, substantially centrally thereof, thus outlining the illustrative shape of the bottom 126 which the container is to have.

To the right of the bottom 126 is defined, by score lines 27, 28 and 29, an end wall 30, and to the left of the bottom 126, by lines 31, 32 and 33, is defined the opposite end wall 34; since the container is to be tapered, the appropriate score lines of these end walls are made appropriately divergent to correspond. The end walls 30 and 34, however, have triangular extensions 35 and 36, respectively, formed by the score lines 37, 38 and 28, and by the score lines 39, 40 and 32, respectively.

Score lines 27 and 29 are extended to the right-hand edge of the blank, as at 41 and 42, and in a similar way score lines 31 and 33 are extended, as at 43 and 44, to the left-hand edge of the blank, these extensions being preferably continuations in a straight line of the lines of which they are extensions.

Thus, there is provided a side wall 45 to one side of the score line 27—41 and a side wall 46 to one side of the score line 29—42 and the outermost edges 47 and 48 thereof, respectively, are given an inclination, where a tapered container is desired, with respect to the score lines 27 and 29, respectively, to correspond to the taper or inclination which the end walls 30 and 34 are to have with respect to each other.

Edges 49 and 50 are preferably straight line continuations of edges 47 and 48, respectively, and they define the outer bounding edges of side wall portions, hereinafter termed "diagonals", 51 and 52, respectively. Diagonal 51 is included between the score line 31—43, a score line 53, edge 49, and edge portion 54. Similarly and symmetrically thereto, diagonal side wall portion 52 is defined by the score line 33—44, edge 55, edge 50, and a score line 56.

The dimensions of the bases A and B of the side walls 45, 46, respectively, are preferably equal, respectively, to the dimensions of the score lines 23, 25, two sides of the bottom 126. The dimension of score lines 53 and 56, being the bases of the diagonals 51, 52, respectively, are preferably less than the score lines 23, 24, for purposes later described.

The blank, in the space between the score lines 53 and 23 and the base A, is cut out as at 57, leaving an edge 58 along a part of the base A preferably slightly less than half of the length of the latter, the remainder of the base A being scored along the line 59. The score line 59 in turn is made to form the base of what will be termed a "flap" 60, bounded by the cut edge 61 and the score line 62.

Alongside of the score line 23 of the bottom 126 there is also formed what will be termed a "flap" 63 of which the score line 23 is the base, score line 62 is part of the right-hand boundary thereof, and a diagonal score line 64 being the left-hand boundary thereof; the upper ends of these diagonal score lines 62, 64 are joined by a broken line of cutting indicated by the reference character 65. At this point, it is to be noted that the altitude of the polygon-forming flap 63, considering the score line 23 as its base, is preferably materially greater than the altitude of the flap 60 considering the score line 59 as its base; the former may be, for example, almost twice the latter.

By thus cutting out, as at 57, there is provided to the right of the score line 53 what will be termed a "flap" 66 which, considering the score line 53 as its base, is bounded by the diagonal score line 64, part of the broken line of cutting 65, straight edge 67, preferably substantially parallel to the score line 53, and by the edge 68 which is in effect part of the edge 49. The altitude of the polygon-forming flap 66, and considering score line 53 as its base, is preferably materially greater than the altitude of the flap 63 and, for reasons later explained in detail, is preferably of an area that is preferably a substantial fraction of the area of the bottom 126.

In like manner the blank is cut out in the space between the score lines 56 and 25 and the base B, as at 68, to form what will be termed flaps 69, 70, 71, corresponding, respectively, in shape and relative dimensions, to the above-described flaps 60, 63 and 66; like the latter, these flaps are joined to one another or are uncut along the score lines 72 and 73. Flap 69 has as its base a score line 74 which is part of the base B, the remainder of the latter being the free edge portion 75.

With the blank thus shaped and scored, and of which certain scorings are later described, the folding operations may now be commenced and hence reference is preferably made first to Figure 3, it being understood that any appropriate apparatus (not shown) may, if desired, be utilized to carry out these steps of folding and sealing.

By any suitable means adhesive is applied to

the blank of Figure 1, preferably while it is still in flat form, over the areas that are stippled in this figure, being, more specifically, applied to the diagonal 51 and flaps 66, 63 and 60, and to the diagonal 52 and the flaps 71, 70 and 69.

To facilitate a readier description but not by way of limitation, let it be considered that the bottom 126 is held in a horizontal plane. First, side walls 45 and 46 are swung into substantially 90° relation to the end wall 30, bending, respectively, along the score lines 27—41 and 29—42. During this operation flaps 60 and 69 are somewhat withheld from completely following the swinging of side walls 45 and 46, respectively, and a bending takes place along the score lines 62 and 72, respectively, and also along the score lines 59 and 74, respectively. The effect of thus swinging the side walls 45 and 46 into substantial parallelism is thus one that tends to some extent to lift up or swing upwardly, about the score lines 23 and 25, respectively, the flaps 63 and 70, and the resistance to complete upward swinging of the latter, due to the connections formed at the score lines 62 and 72, effects an outward tilting or bowing of the flaps 60, 69.

Preferably at the same time the parts 45, 30 and 46 are also swung upwardly as a unit, about the score line 24 of the bottom 126, this upward swinging, ultimately, as later pointed out, throughout a substantially 90° angle, causing the flaps 63 and 70 to be bent downwardly about their score lines 23 and 25, respectively, the flaps 60 and 69, respectively, acting as compression links to bring that downward swinging about.

Appropriately timed in relation to the above described movements, diagonals 51 and 52 are likewise swung or bent upwardly about their respective score lines 31—43 and 33—44; this upward swinging of the diagonals, which carry with them the flaps 66 and 71, respectively, commences slightly later than the above-described upward swinging into parallelism of the side walls 45 and 46 and correspondingly the upward swinging of the end wall 34 about the score line 26 is preferably slightly delayed or may be synchronized with the upward swinging of the opposite end wall 30 about the score line 24. As the end wall 34 thus swings upwardly about the score line 26, flaps 66 and 71 act as compression members to aid in swinging the flaps 63 and 70 downward, but bending of these flaps at the score lines 53 and 56 begins.

Base A of said wall 45 finally comes into coincidence with substantially the score line 23 and base B of the side wall 46 comes into substantial coincidence with score line 25; edges 47 and 48 (Figure 1) of the two side walls come into abutting relation or coincidence with the score lines 31—43 and 43—44, respectively.

The relationship of the parts at this stage is shown in Figures 4 and 5. Flaps 63 and 70 are now in general downward position with the face having adhesive applied thereto exposed outwardly excepting for those portions of each against which flaps 60 and 69, respectively, have been laid with their adhesive faces. Thus, at two corners of the bottom 126, namely corners E and F (Figures 1, 3 and 5) there is brought about a two-ply fold or flap, the parts of which are secured together by adhesive.

But because of the difference in dimension and particularly in altitude between flaps 63 and 60 and flaps 70 and 69, very substantial portions of the larger flaps 63 and 70 are now exposed laterally by way of those faces thereof that have adhesive applied thereto (see Figure 5).

Accordingly, as diagonals 52 and 51 are now continued to be swung about the axes of their respective fold-lines 33—44 and 31—43 (in Figure 5, to show certain parts more clearly, these diagonals are shown as still in the plane of the end wall 34—36), score lines 56 and 53 are brought into substantial coincidence with score lines 25 and 23, respectively; the diagonals 51 and 52, with their inside faces covered with adhesive, are laid against portions of the side walls 45 and 46, respectively, while flaps 66 and 71, also covered on their inside faces with adhesive, are laid against the composite or doubled-over flaps 60—63 and 69—70, respectively. Thus, viewing Figure 6, flap 66, of materially greater area and dimension than the composite flap 60—60, is laid against and secured to the outer face of the flap 60 to which it becomes secured by its own adhesive and against so much of the flap 63, covered with adhesive, as is not covered by the flap 60, resulting in a relationship better shown in Figures 6 and 7. Thereby, there is formed at each of the corners G and H (Figure 3) a double fold; as to corner G, this double fold comprises flaps 63 and 66 creased along the score line 64, and as to corner H, it is made up of flaps 70 and 71 creased along the score line 73. Moreover, each double fold, as was true of the double folds at corners E and F, has its component layers or parts joined together by adhesive that had been applied to both.

As better appears from Figure 6, where the now superimposed flaps 60, 63 and 66 are clearly shown, flap 66, because of its greater area and altitude, still exposes inwardly a very substantial area covered with adhesive, being so much of the entire area of the flap as is not taken up by the composite flap 60—63. Accordingly, and referring now to Figures 7, 8 and 9, the flaps 66 and 71 are now bent inwardly and up against the bottom 126, carrying with them the composite flaps 60—63 and 69—70 which adhere thereto. In each case three layers of paper stock fold inwardly against the bottom 126. It is to be noted that the various parts or flaps, or the like, which are thus made to adhere to each other or to other parts are so constructed and arranged that the adhesive (see now Figure 1) may be initially applied only to one side or face of certain parts of the blank, a feature of great economy and advantage, particularly where machinery is employed to achieve the various folding operations.

The flaps 66 and 71 are preferably given an area and shape, as already above described (Figures 1 and 3) whereby, when the above folding operation takes place causes the flaps 66, 71 (Figure 9) together to substantially match or cover the entire area of the bottom 126; illustratively, but not by way of limitation, each of these flaps may be commensurate in area with half the area of the bottom 126. In such case, not only are the inside composite flaps 60—63 and 69—70 securely held and folded up against the under side of the bottom 126 but also the latter becomes covered by the two flaps 66 and 71 and thus reinforced; if the latter two flaps are made larger so as to overlap, the resultant bottom structure becomes additionally reinforced and strengthened.

The container structure thus far achieved now appears as shown in perspective in Figure 10. The edge 47 of side wall 45 is snugly fitted into the corner formed by the diagonal 51 and the

end wall 34—36; the upper edge 54 of the diagonal 51 substantially mates with a portion 80 of the top edge 81 of the side wall 45 and this is preferably a relatively small fraction of the whole edge 81, for purposes later described. The edge 49 of the diagonal 51 extends diagonally from these registering top edges 54, 80 toward the corner F which it preferably closely approaches, the flap 66, secured to the bottom 126 and holding the composite flap 60—63 in its folded position, being thus mechanically supported and upwardly extended by the diagonal 51. In a similar manner, and as is shown in Figure 10, the upper edge 55 of the diagonal 52 registers substantially with a portion 82 of the top edge 83 of the side wall 46, whence its edge 50 extends diagonally downwardly toward and closely approaching the corner E; flap 71, being an integral part of this diagonal 52, is thus by the diagonal 52 given a mechanical support that extends all the way to the top edges of the container structure, for purposes later described.

At the top edge of the resultant container construction (Figure 10), therefore, I have provided two thicknesses of the paper stock at the right-hand end of each of the side walls 46—52 and 45—55; the two thicknesses of the former are shown in Figure 10 indicated by the top edge portions 55 and 82, and of the latter by the top edge portions 54 and 80. The parts forming the upper or top portion of the container construction are now folded in a manner to avoid having to fold or crease these doubled thicknesses and, disregarding for the moment the left-hand end of the top, as shown in Figure 10, the two opposed composite side walls are along their top edges brought toward each other, the opposed side walls 46—52 and 45—51 bending or curving, throughout their upper portions, toward each other to bring these top edge portions together.

In so doing, however, the triangular end wall portion 36 (see now Figures 1 and 11) is bent inwardly about the score line 32 as an axis, the paper yielding or folding along the score lines 39 and 40 and along a short score line 84 which runs from the apex of the triangular wall portion 36 to the edge of the blank. Thereby, two portions 85 and 86, generally trapezoidal but closely approaching a triangle, as shown in Figures 2 and 11, are folded inwardly and their upper edges 87 and 88 are brought together but become interposed between the double wall or edge parts 55—82 and 54—80, as is better shown in Figure 13 on an enlarged scale. It will be noted that thereby the top edges 83 and 81 are brought together (see also Figure 11) and at the extreme right-hand edge, as viewed in Figure 13, six thicknesses of paper are provided by this overlapping or folding relationship.

While the above folding operations are being carried on, the left-hand portions, as viewed in Figure 10, are also being folded, and in that connection certain fold or score lines adjacent the triangular end wall part 35 (Figure 1) are brought into play; thus, in Figure 1, it will be seen that the score line 89 substantially bisects the angle between the score lines 37 and 41 while a score line 90 is similarly related to the score lines 38 and 42. There are thus formed or outlined polygonal areas or portions 91, 92, 93 and 94 terminating in the edge of the blank in edge portions 95, 96, 97 and 98, respectively. Preferably the edge portions 96 and 97 make an obtuse angle with each other for purposes later described, the point of intersection thereof being joined by a score line 99 to the apex of the triangular wall part 35. Score line 99 is preferably in the form of a double scoring along two spaced but substantially parallel lines, thereby to a larger radius of curvature or bending, in later stages, and to minimize the possibility of cracking or rupturing the paper.

Now, as the top edges 81, 83 of Figures 10 and 13 are brought toward each other, two principal folding steps or operations are performed. First, folding or bending about the score lines 89 and 90 is made to take place followed by reverse folding or bending along the score lines 41 and 42, thereby to bring the portion 94 and portion 93 with their inside faces together and similarly to bring portions 91 and 92 together, as indicated in Figure 13, the area represented by the three polygons 35, 92 and 93 (Figures 1 and 10) remaining in a single plane, a plane coincident, illustratively, with the plane of the end wall 30.

Thus, viewing the construction as in Figure 13, there are provided two composite flaps 94—93 and 91—92. The next step is preferably one which folds these composite flaps each toward the right, as viewed in Figure 13, and, respectively, against the upper inwardly curved or bowed parts of the side walls 46 and 45, giving a relationship as shown in perspective in Figure 12 and as shown on enlarged scale in plan in Figure 14. In the latter, therefore, the left-hand upper edge portions have been folded to provide six thicknesses of paper, the thicknesses being represented by the edges or thicknesses 95, 96, 81, 83, 98 and 97 of the portions (see Figures 10 and 11) 92, 91, 45, 46, 94 and 93, respectively.

The edge portions of these six thicknesses are in substantial alinement and one of the reasons for establishing the obtuse angle relationship between the edges 96—97 of Figure 1 is to insure better alinement or coincidence of the multiple top edges when this folding takes place. Also, the short score line 99 (Figures 1, 10 and 12) facilitates and insures appropriate bending of the above-mentioned composite flaps into the above-described closing position.

The relationship at the top edges having been established as shown in Figure 14, the parts are held in this overlapping and closing relationship preferably by means of a clamp 100 of suitably strong sheet metal, shaped as is shown in perspective in Figure 15. In length the clamp is sufficient to take over and enclose the above-described alined top edges, as shown in Figures 12 and 14. It has a front flange 101 and a rear flange of commensurate extent but having a cut 102 therein so as to divide it into substantially two flanges 103 and 104. The left-hand edge of the flange part 104 has an extension or flap 105.

This U-shaped clamping device 100 is now seated over the above-described folded top edge, snugly receiving the latter therein, whence any suitable means is employed to press the two opposed flanges 101 and 103—104 toward each other, thus laying these flanges tightly and snugly along and against the balanced contour of the folded top edge, and securely clamping the overlapping or folded top portions of the container structure against each other and thus sealing the container. Thereupon the end flap 105 (Figure 15) is bent, as shown in Figure 16, around the left-hand end of the resultant construction and brought to overlap the front flange 101. This flap 105 thus covers over and encases those portions of the folds including and adjacent the score line 99 (Figure 12) thus mechanically and

otherwise protecting the latter and adjacent parts.

In Figure 17 is shown the resultant relationship from which it will be seen how the flanges of the clamping member 100 are snugly laid against and clamp the folded top edge portions to effect the seal. At the respective ends, the clamping device 100 clamps the same number of thicknesses, illustratively six, of paper, and from these thickened end portions the intermediate portions of the clamp 100 dependably and securely clamp the juxtaposed and contacting upper ends of the side walls 45 and 46. This preferred mechanically balanced arrangement is desirable from several viewpoints. For example, the mechanism for compressing the clamp 100 operates in a balanced manner and better uniformity of clamping action and of permanence thereof, is achieved. Also, a sliding of the clamp 100 in the direction of its length and relative to the container is dependably prevented, the increased thicknesses at the two ends forming stops for this purpose.

But thereby also desirable interactions with other parts of the container construction are achieved. For example, and bearing in mind that the container is now to be considered as filled with, for example, a liquid, the sheet metal clamp 100 mechanically unites, for certain bracing purposes, a plurality of diagonal bracing structures thus provided in the construction. For example, the composite flaps 93, 94 and 91, 92, in coaction with the bends therein along their bounding score lines (see Figures 1 and 10), thus offer very substantial resistance to compression and also to stresses of tension, and, moreover, as is better shown in Figures 11 and 12, they substantially parallel, diagonally, the diagonals 52 and 51, respectively; the latter, in conjunction with the side wall portions which they overlie and to which they are glued, also form strong compression and tension members.

If the filled container is dropped and lands on its bottom or on a corner thereof, the above-described plurality of diagonals act as compression members, unity of action thereof being insured by the clamp 100, and they insure dependable prevention of distortion or bursting of a container. Should the filled container be dropped and land upside down, this same plurality of diagonals again functions as a series of compression members, the clamp 100 insuring the distribution of the blow or impact uniformly to all of them, and the latter take up the force of the blow and distribute it throughout the parts of the container, and again bursting or rupture of the latter is prevented. In the former instance, the construction at the bottom corners E, F, G and H, insures that the impact of the blow or of the dropping is transmitted by one or both of the flaps 66 and 71 to their respective diagonals 51 and 52, and by the latter distributed throughout the other parts of the container, including distribution of the strains to and through the clamp 100 and the diagonal folds or composite flaps 94—93 and 91—92, and by the latter distributed to their associated container parts. In the other case, where the container happens to strike top downward, the various diagonals act as braces and compression absorbing and transmitting members, including the distribution of strains to and the absorption thereof in the bottom 126 by way of the bottom flaps 66 and 71.

Tests demonstrate, by way of dropping of the container of my invention when filled with liquid from substantial heights, that no matter what portion of the container receives the blow or the impact, deformation, rupture or bursting of the container does not take place and I can account for these results, as I understand the structural theories involved, only by such dissipation of strains and stresses to and throughout various or all parts of the container, as have just been described above. I am thereby enabled to cause each material part of the construction to take part in distributing an impact or its force to other parts so as to bring all parts into functioning to absorb the strain or stress, and thus I am enabled to avoid overstressing of any one part or concentrated group of parts.

In a broadly similar way, tensional strains are likewise distributed and dissipated, though in normal usage tensional strains are caused principally by the carrying of the filled container by grasping it at the top, utilizing the clamp 100 and immediate adjacent parts as the part to be grasped by the fingers of the hand; in such case, the plurality of diagonals takes part in insuring distribution of the strains and in particular the diagonals 51 and 52 act as tension members to transmit the primary load or weight (or hydraulic head) from the composite bottom flaps and particularly the flaps 66 and 71 at the top parts of the container by which the latter happens to be held or suspended; in such case, dependable prevention of overstressing the side or end wall portions is made possible.

Additionally, leakage is dependably prevented particularly at the corners of the bottom 126, each corner E, F, G and H of which has, as above described, a strong and dependable bellows-like fold the adjacent faces of which are securely and dependably glued together.

At an appropriate point in the above-described steps, particularly at the completion of the stage shown in Figure 10, the container construction may be and preferably is dipped in or impregnated with or otherwise treated with a suitable waterproofing compound, such as wax, paraffin, or the like, but it is to be noted that, because of the above-described construction of the bottom part of the container, I do not have to rely upon any sealing action at the corners of, or at overlaps in, this bottom construction.

In transit or carriage, the folds or flaps shown at the left in Figure 14 or Figure 17 are mechanically encased and protected and, moreover, are maintained in a strictly sanitary condition by the clamp 100 and particularly the end flap 105 (Figures 15 and 16) thereof. When it is desired to make use of the contents of the container, the end of the clamp 105 (Figure 16) is unbent or unwrapped whence it may be used as a tab or handle to pry or bend the flange part 104 in a direction away from the opposite flange 101, the cut 102 (Figure 15) giving the flange part 104 a relatively short length commensurate with the length along the top edge of the composite flap 93—94 (Figure 17); this short length makes less metal thus to bend up and the bending up process is easily accomplished. Thereafter, the entire portion of the sheet metal clamp 100 that extends to the left of the plane of the cutting line 102 may be bent, the bending in effect being simply a bending of the front flange 101 at a line or point opposite the line 102. The clamp part thus assumes a relationship somewhat as is shown in Figure 18. The remainder of the clamp, comprising the flange part 103 and so much of the flange 101 that is juxtaposed to it, continues to hold the remaining or right-hand

top edge parts of the container in clamped relationship.

Thus, the double folds or flaps 94—93 and 91—92 become exposed, appearing as shown in Figure 14; with two fingers of the hand, these double flaps are engaged at their respective diagonal fold lines 89 and 90 (Figure 12), and are opened or bent outwardly, the four polygonal parts 91, 92, 93 and 94 being thus made to assume the relationship shown in Figure 18, thereby forming in effect a spout through which the contents of the container may be poured. In so doing, it will be seen that the double flaps 94—93 and 91—92 are clasped and handled externally, thus avoiding contamination of inside surfaces, and, moreover, by an easily manipulated movement.

If the container is not completely emptied, it is still possible, by reversely folding or actuating the spout-forming parts to restore them to the relationship shown in Figures 14 and 12, whereupon the clamp parts 101—104 may be manually restored to a sufficiently satisfactory temporary holding relationship, if desired.

In the illustrative embodiment above described, certain of the score lines on the blank of Figure 1 are, as shown and described, so related to each other that the completed container has a main body portion whose horizontal cross-section progressively increases from the bottom upwardly; it is to be understood that this is by way of illustration and not by way of limitation, but that this form of construction has certain practical advantages.

It will thus be seen that there has been provided in this invention a container blank, a container construction, and a method of achieving the latter in which the various objects hereinabove noted, together with many thoroughly practical advantages, are successfully achieved.

As many possible embodiments may be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A container blank comprising a sheet of paper substantially trapezoidal in shape having quadrangular fold lines centrally thereof to outline a bottom and fold lines extending to each of two sides of said bottom to outline two end walls each surmounted by a triangular top end wall portion to each side of each of which triangular top end wall portions are fold lines which include extensions of the fold lines defining said end wall, there being to each side of that one of said end walls that is formed in the wider portion of said trapezoidal blank a substantially trapezoidal side wall, and there being to each side of the other end wall that is outlined in the narrower portion of the trapezoidal blank a substantially trapezoidal diagonal, there being formed adjacent each of the remaining two opposed sides of said bottom three flaps, the line of cutting of none of which extends to a corner of said bottom, the first of said flaps being along the bottom edge of a side wall, the second being along one of said opposed side edges of said bottom, and the third being along the bottom and hence wider edge of said diagonal, and said flaps being of progressively increasing area in the order just named.

2. The method of folding a blank as claimed in claim 1 to form a container and close it which comprises applying adhesive to each of said diagonals and said flaps, all on the inside faces thereof, bending said two end walls toward each other about the end fold lines of said bottom, bending said side walls and said diagonals inwardly about the fold lines respectively demarking them from said end walls but with said side walls embraced within said diagonals, whereby the faces of said diagonals that have adhesive thereon may be ultimately brought into overlapping relation to their respectively opposed side walls, folding each of said first flaps against said second flaps, respectively, with their adhesive-carrying faces toward each other and folding them in a direction downwardly below said bottom, thereby to expose laterally the adhesive-free face of each of said first flaps and the remainder of the adhesive-carrying faces of said second flaps, and with the completion of bringing the adhesive-carrying faces of said diagonals against the said side walls, respectively, folding each of said third flaps with their adhesive-carrying faces against said laterally exposed faces of their respective first and second flaps, thereby exposing inwardly a substantial area of each of said adhesive-carrying faces of said third flaps, and then folding the two composite flaps, each comprising its respective said first, second and third flaps, into the plane of the under face of said bottom, whereby said diagonals form extensions, respectively, of said third and largest flaps up to the top edge at one end of the container, folding the polygonal sections intervening the triangular top and wall portions and the upper portions of their respectively adjacent side walls and diagonals toward and against the upper portions of their respectively adjacent side walls to bring the top edges of said polygonal sections of said side walls and of said diagonals together in a substantially straight line, and fastening said brought-together top edges against separation, thereby to anchor the narrower ends of said diagonals along said straight line top edge and thereby to extend thereto the support of the bottom by way of said largest or third flaps.

3. A paper container having a main body portion that is quadrangular in cross-section, a bottom, and a top portion, all made out of a single sheet of material, two end walls of said main body portion comprising extensions of two opposed ends of the bottom and each terminating in a triangular upper end part, there being in adjoining relation to two sides of each triangular part foldable parts of substantially inverted triangular shape, one of said end walls having lateral extensions that take part in forming two side walls of the container, said lateral extensions having an upward extent sufficient to adjoin respectively the inverted triangular parts adjacent the upward triangular extension of said end wall, each lateral extension being overlapped and having secured thereto by an adhesive a diagonal, thereby to form said side walls, each of said diagonals being alongside of the other of said end walls and said diagonals being of sufficient upward extent to adjoin respectively the inverted triangular parts adjacent the triangular extension of said other end wall, the said top portion being formed by said upward extents of said two lateral extensions with said upward extents of said diagonals adhered thereto, the opposed top edges of said side walls being brought together and said inverted triangular portions being folded relative to

said side walls and said triangular extensions, means securing against separation said brought-together top edges of said side walls and of said folded parts and including also the upper ends of said diagonals, said bottom having folded externally thereagainst and secured thereto by an adhesive two composite flaps each of which comprises three joined-together flaps, the first of which is a flap extension of a side wall, the second of which is a flap extension of said bottom, said two flaps being folded against each other and secured together by adhesive, and the third of which is a flap extension of one of said diagonals, said third flap being largest of the three, whereby each of said third flaps is mechanically joined to said top securing means through the diagonal of which it forms a part.

4. A paper container having a main body portion that is quadrangular in cross-section, a bottom, and a top portion, all made out of a single sheet of material, two end walls of said main body portion comprising extensions of two opposed ends of the bottom and each terminating in a triangular upper end part, there being in adjoining relation to two sides of each triangular part foldable parts of substantially inverted triangular shape, one of said end walls having lateral extensions that take part in forming two side walls of the container, said lateral extensions having an upward extent sufficient to adjoin respectively the inverted triangular parts adjacent the upward triangular extension of said end wall, each lateral extension being overlapped and having secured thereto by an adhesive a diagonal, thereby to form said side walls, each of said diagonals being alongside of the other of said end walls and said diagonals being of sufficient upward extent to adjoin respectively the inverted triangular parts adjacent the triangular extension of said other end wall, the said top portion being formed by said upward extents of said two lateral extensions with said upward extents of said diagonals adhered thereto, the opposed top edges of said side walls being brought together and said inverted triangular portions being folded relative to said side walls and said triangular extensions, means securing against separation said brought-together top edges of said side walls and of said folded parts and including also the upper ends of said diagonals, said bottom having folded against it externally and secured thereto by an adhesive a plurality of superimposed flaps, the two outermost of which are flap-like extensions of said two diagonals, respectively, whereby said bottom is reinforced and mechanically connected by said diagonals to said top-securing means.

5. A paper container having a main body portion that is quadrangular in cross-section, a bottom, and a top portion, all made out of a single sheet of material, two end walls of said main body portion comprising extensions of two opposed ends of the bottom and each terminating in a triangular upper end part, there being in adjoining relation to two sides of each triangular part foldable parts of substantially inverted triangular shape, one of said end walls having lateral extensions that take part in forming two side walls of the container, said lateral extensions having an upward extent sufficient to adjoin respectively the inverted triangular parts adjacent the upward triangular extension of said end wall, each lateral extension being overlapped and having secured thereto by an adhesive a diagonal, thereby to form said side walls, each of said diagonals being alongside of the other of said end walls and said diagonals being of sufficient upward extent to adjoin respectively the inverted triangular parts adjacent the triangular extension of said other end wall, the said top portion being formed by said upward extents of said two lateral extensions with said upward extents of said diagonals adhered thereto, the opposed top edges of said side walls being brought together and said inverted triangular portions being folded relative to said side walls and said triangular extensions, means securing against separation said brought-together top edges of said side walls and of said folded parts and including also the upper ends of said diagonals, said bottom having folded thereagainst at least two flap means respectively comprising extensions of said two diagonals, whereby said bottom is reinforced and mechanically connected through said diagonals to said top-securing means, said top-securing means having a portion thereof releasable at that end thereof remote from the upper termini of said diagonals, whereby the folded inverted triangular portions thereby released may be unfolded to form a pouring spout, and said diagonal mechanical connection between said flap means and the top-securing means remains undisturbed.

6. A paper container having a main body portion that comprises two side walls and two end walls, a bottom, and a top portion, each of said side walls comprising two layers of paper adhesively secured together, one layer being an extension of one of said end walls and the other layer being an extension of the other of said end walls, the outer layers having flap extensions that overlie and are adhesively secured externally against said bottom, whereby the latter is reinforced and is mechanically connected by said outer layers to the top edges of said side walls, said top portion comprising the upper parts of said two-layered side walls brought toward each other with their top edge portions extending along a line and the upper portions of said opposed end walls folded so that their uppermost edge portions also lie along said line, and means securing all of said upper edge portions, including those of said outer layers of said two side walls, against unfolding or separation, whereby said mechanical connection formed by said outer layers is anchored to the multiple-layered structure along said line.

7. A paper container made of a single sheet and comprising a four-sided bottom, one side of which is extended to form an end wall, said end wall being extended laterally to form two side wall portions, and the opposed side of which bottom is extended to form an opposed end wall, said opposed end wall having lateral extensions that overlap and are adhesively secured, respectively, to said side wall portions, each of the remaining sides of said bottom having a flap extension which, at its two ends, is connected to flap extensions of the adjacent side wall portion and of the adjacent lateral extension, said flap being, with said two flap extensions, interfolded to form a composite flap that extends underneath and is adhesively secured to said bottom, the upper ends of two opposed walls being brought with their free edge portions along a line and the upper portions of the remaining two opposed walls being folded and having folded edge portions brought along said line, and means holding the parts thus brought along said line against separation.

8. A paper container made of a single sheet and comprising a four-sided bottom, one side of which

is extended to form an end wall, said end wall being extended laterally to form two side wall portions, and the opposed side of which bottom is extended to form an opposed end wall, said opposed end wall having lateral extensions that overlap and are adhesively secured, respectively, to said side wall portions, each of the remaining sides of said bottom having a flap extension which, at its two ends, is connected to flap extensions of the adjacent side wall portion and of the adjacent lateral extension, said flap being, with said two flap extensions, interfolded to form a composite flap that extends underneath and is adhesively secured to said bottom, the flap extensions of said lateral extensions of said other end wall being together of an area commensurate with that of said bottom and substantially covering the latter.

9. A container blank comprising a sheet of paper substantially quadrangular in shape having, substantially centrally thereof, quadrangular fold lines to outline a bottom, fold lines extending to each of two sides of said bottom to outline two end walls each surmounted by a triangular top end wall portion to each side of each of which are fold lines which include extensions of the fold lines defining said end wall, there being to each side of each of said end walls lateral extensions outlining respective areas to form ultimately a side wall of two layers, said lateral extensions being of a height commensurate with the total height of an end wall and its triangular top end wall portion, certain of said lateral extensions having flap extensions, all within the said quadrangular shape of paper sheet, for ultimately underlapping said bottom in a direction transverse to the axis of said bottom and two end walls.

10. A paper container made of a single sheet and comprising a four-sided bottom, one side of which is extended to form an end wall, said end wall having lateral extensions to form portions respectively of two side walls, and the opposed side of which bottom is extended to form an opposed end wall, said opposed end wall having lateral extensions to form the remaining portions of said two side walls, juxtaposed lateral extensions being overlapped and adhesively secured together, certain of said lateral extensions having flap extensions folded under and adhesively secured to said bottom, the folding thereof being about one of the remaining sides of said bottom.

11. A paper container made of a single sheet and comprising a four-sided bottom, one side of which is extended to form an end wall, said end wall having lateral extensions to form portions respectively of two side walls, and the opposed side of which bottom is extended to form an opposed end wall, said opposed end wall having lateral extensions to form the remaining portions of said two side walls, juxtaposed lateral extensions being overlapped and adhesively secured together, each of the remaining sides of said bottom having a flap extension that is folded about the line of said side as an axis and against a face of said container, and at least one of said two lateral extensions that form each of the side walls of said container having a flap extension folded about the same line as said first-mentioned flap extension and against and adhesively secured to the under face of said bottom.

12. A paper container made of a single sheet and comprising a four-sided bottom, one side of which is extended to form an end wall, said end wall having lateral extensions to form portions respectively of two side walls, and the opposed side of which bottom is extended to form an opposed end wall, said opposed end wall having lateral extensions to form the remaining portions of said two side walls, juxtaposed lateral extensions being overlapped and adhesively secured together, each of the remaining sides of said bottom having a flap extension which, at an end thereof, is connected to a flap extension of the adjacent one of said lateral extensions and being together folded under and adhesively secured to said bottom, the folding thereof being about one of the remaining sides of said bottom.

13. A paper container made of a single sheet and comprising a four-sided bottom, one side of which is extended to form an end wall, said end wall having lateral extensions to form portions respectively of two side walls, and the opposed side of which bottom is extended to form an opposed end wall, said opposed end wall having lateral extensions to form the remaining portions of said two side walls, juxtaposed lateral extensions being overlapped and adhesively secured together, each of the remaining sides of said bottom having a flap extension which, at its two ends, is connected to flap extensions of the two adjacent lateral extensions to form a composite flap that extends underneath and is adhesively secured to said bottom and the folding thereof being about one of the remaining sides of said bottom.

14. A paper container made of a single sheet and comprising a four-sided bottom, one side of which is extended to form an end wall, said end wall having lateral extensions to form portions respectively of two side walls, and the opposed side of which bottom is extended to form an opposed end wall, said opposed end wall having lateral extensions to form the remaining portions of said two side walls, juxtaposed lateral extensions being overlapped and adhesively secured together, each of the remaining sides of said bottom having a flap extension which, at its two ends, is connected to flap extensions of the two adjacent lateral extensions to form a composite flap that extends underneath and is adhesively secured to said bottom and the folding thereof being about one of the remaining sides of said bottom, the outermost of said flap extensions when said composite flap is folded under said bottom being larger than the remaining two flap extensions thereby to expose a portion of its face to said bottom, said exposed portion being adhesively secured to said bottom.

15. The method of folding a blank to form a container, said blank comprising a sheet of paper generally quadrangular in shape and having, substantially centrally thereof, quadrangular fold lines to outline a bottom, fold lines extending to each of two sides of said bottom to outline two end walls and means including fold lines outlining lateral extensions of each outlined end wall, there being formed adjacent each of the remaining two opposed sides of said bottom three flaps the line of cutting of none of which extends to a corner of said bottom, the first of said flaps being along the bottom edge of one of the adjacent lateral extensions, the second being along one of said opposed sides of said bottom, and the third being along the bottom edge of the other of said lateral extensions, which comprises bending said two end walls toward each other about the end fold lines of said bottom, bending said lateral extensions of each end wall inwardly about the fold lines demarking them from the end wall of which they are extensions to bring lateral ex-

tensions of said end walls into overlapping relationship and adhesively securing together overlapped lateral extensions to form two opposed side walls, folding said first flaps respectively against said second flaps and folding them together in a direction downwardly below said bottom and folding said third flaps respectively against the interfolded first and second flaps to form a composite flap of three layers, then folding the resultant two composite flaps, each comprising its respective said first, second and third flaps, into the plane of the under face of said bottom and securing them adhesively against said under face of said bottom.

16. The method of folding a blank to form a container, said blank comprising a sheet of paper generally quadrangular in shape and having, substantially centrally thereof, quadrangular fold lines to outline a bottom, fold lines extending to each of two sides of said bottom to outline two end walls and means including fold lines outlining lateral extensions of each outlined end wall, there being formed in the angle between each of the remaining two sides of said bottom and the bottom edge of the adjacent lateral extension of one end wall two connected flaps, one being an extension of the said bottom along said side and the other being an extension of the said lateral extension along its said bottom edge which comprises bending said two end walls toward each other about the end fold lines of said bottom, bending said lateral extensions of each end wall inwardly about the fold lines demarking them from the end wall of which they are extensions to bring lateral extensions of said end walls into overlapping relationship and adhesively securing together overlapped lateral extensions to form two opposed side walls, folding said two connected flaps into face-to-face engagement along their line of connection and in a direction downwardly below said bottom, thereby to form at each of said remaining sides of said bottom a downwardly extending composite flap, and then folding and securing against the under face of said bottom said two composite flaps.

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