METHOD OF AND MEANS FOR MAKING CONTAINERS

George Arlington Moore, Louisville, Ky., assignor to Humo Co Corporation, Louisville, Ky., a corporation of Delaware

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This invention relates to flanged articles of manufacture such as containers made of paper or other fibrous material, and more particularly to a method of folding a blank of fibrous material to form a flanged article having angular corners.

One of the objects of the present invention is to provide a novel method of forming a flanged article from a flat blank of fibrous or other foldable material.

Another object of the invention is to provide a novel method of folding the flange and flange corners of an article wherein said corners are folded in a novel manner.

Still another object is to provide a novel method of forming a container constructed of paper or other fibrous material and having angular corners wherein the side walls are seamless and integral with the base portion of the container.

A further object is to provide a novel method of folding the material of a blank adjacent the corner of a flange constituted by a turned-up marginal portion of said blank whereby the folds are symmetrically disposed with respect to said corner.

A still further object is to provide a simple and inexpensive method of folding the marginal portion of a blank to form a flange or the side walls of a container, said method being adapted to be carried out automatically, if desired, by the use of a small number of mechanical parts, the operation of which does not require the constant attention of skilled attendants.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when taken in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings is for the purpose of illustration only and is not designed as a definition of the limits of the invention, reference being primarily had for that purpose to the appended claims.

The drawing, wherein like reference characters refer to like parts throughout the several views, is as follows:

Fig. 1 is a view of the top or inner face of one corner of a blank which may be employed in carrying out the method of the present invention; Fig. 2 is a similar view of the bottom or outer face of the blank of Fig. 1; Figs. 3 and 4 show successive positions assumed by the blank of Fig. 1 during the process of folding the same in accordance with the present invention; Fig. 5 is a top plan view, with parts broken away, of one corner of a completed article; Fig. 6 is a section taken on line 6—6 of Fig. 5; Fig. 7 is a plan view, with parts broken away, of the female and footing dies employed in a machine for carrying out the method of the present invention; Fig. 8 is a sectional side elevation, with parts broken away, showing an intermediate position of the die members of said machine, and, Fig. 9 is a sectional side elevation, with parts broken away, showing the positions of the die members at the completion of the folding operation.

The present invention comprehends a novel method of forming or folding a blank into a flanged article, such as a container having two or more side walls which intersect at a comparatively sharp angle, as distinguished from a circular or similar curved wall container, wherein the flange will not only be integral with the base of the container but will also be continuous or seamless. Containers thus produced are superior to others of a similar shape heretofore provided in that the walls of the same are impervious to air and moisture and the container lends itself to the packing of fine granular substances without danger of leakage. In the illustrated embodiment, a portion only of an article or container having an angular corner is shown, by way of example.

It will be considered, for the purposes of description, that the illustrations of Figs. 1 to 6, inclusive, represent but one corner of a rectangular container which comprises a blank 12 having a central or base area 13 and a margin or flange portion 14 surrounding said base area. Preferably, the corners of the blank are trimmed along line 15 prior to the folding operation to be hereinafter described in order that the upper edges of the corner folds to be formed will be flush with the edges of margin or flange 14 when the latter is turned up to constitute the side walls of the container.

If desired, blank 12 may be scored to form an external bead 16 outlining base portion 13 for the purpose of facilitating the folding of said blank and for giving increased rigidity and strength to the completed article or container. To facilitate the folding of the corner areas included in the right angle between lines a and e, the blank may also be scored along lines a to e, inclusive, scores a, e and e producing slight
beads on the lower face of the blank, and scores b and d producing beads on the inner face thereof. As will hereinafter appear, however, none of the above described scores are essential elements in practicing the present invention, but are merely illustrated and described as elements of a preferred embodiment.

In paper containers, and containers comprised of like materials heretofore provided, the corners are weakened by the provision of a seam in the flange or side walls thereof at or near said corners. In other prior art containers, a single thickness of material is employed at the corners, thus rendering the same susceptible to crushing under slight stresses, particularly in those wherein the material is weakened by the necessary breaking down of the body or fabric thereof when the same is bent to form said corners. In many containers of the latter type, additional pieces of fiber or tape are secured about the corners thereof by means of staples or a suitable adhesive for the purpose of reinforcing the same in some degree, but this entails extra expense and labor. By the method of the present invention, a container having reinforced, seamless angular corners in the side walls thereof and having said side walls integral with the base of the container is adapted to be readily and inexpensively made from a single blank of material.

The novel method proposed comprises folding the marginal portions 14 of blank 12 along the line or outer edge of score 16 into a position substantially perpendicular to the base portion 13, thereby forming the side walls of the container. Simultaneously with the folding of said side walls, the corner area included between lines a and c of the margin 14 of the blank is creased and folded along each of the lines a to e inclusive. Each of the creases a, c and e approaches a vertical position above the corner of base area 13, while creases b and d are caused to move inwardly at a greater rate than the other three and beyond the vertical, thereby forming two corner folds 1, 2, and 3, 4. During the formation of said corner folds, creases b and d are preferably guided in diverging paths so that the upper or inner surfaces of segmental areas 1 and 4 may be brought into engagement with the side walls 14 adjacent said surfaces and at opposite sides of the corners.

For the purpose of maintaining the flange and corner folds in position after the same have been formed, a suitable adhesive is applied to the inner or outer faces of segmental areas 1 and 4 (Fig. 1) which, as already noted, are caused to engage the side walls 14, and to the outer faces of segmental areas 2 and 3 (Fig. 2) which engage the outer surfaces of areas 1 and 4, respectively. The adhesive employed is preferably a thermoplastic lacquer adapted to be activated by heat and pressure without the application of a solvent. When said adhesive is rendered tacky by heat and pressure is simultaneously applied to the folds, the engaging surfaces of said folds and side walls are substantially welded together.

One form of the novel mechanism for carrying out the method above described is illustrated in Figs. 7 to 9, inclusive, only that portion of the machine employed for folding one corner being shown. In the form illustrated, the machine comprises a female die member 17 having a yielding supported footing die 18 engaging the inner walls thereof and adapted to reciprocate therein, a male pressing die 19, and a folding and stripping die 20 surrounding and contacting said pressing die. Any suitable mechanism, many of which are well-known in the art, may be provided for imparting the desired reciprocating movement to dies 18 and 20, and since such actuating mechanism constitutes no part of the present invention, it is believed to be unnecessary to illustrate and describe the same.

Female die 17 is provided with a central opening, the lower inner walls 21 of which are integral and are adapted to position and guide footing die 18, the upper face of which corresponds in size and shape to the bottom of the container or article which it is desired to make. The upper inner walls 22 of die 11 are inclined upwardly and outwardly from vertical walls 21 for the purpose of initiating the bending of the marginal portion 14 of blank 12 in the formation of the flange or side walls of the container being produced, the width of inclined surfaces 22, as seen in Fig. 8, preferably being somewhat greater than the width of flange 14 of blank 12. The angle of inclination or slope of walls 22 is shown in the drawing to be substantially 45°, but any suitable degree of inclination may be employed, depending on the weight and quality of the material constituting the blank to be formed.

In order to crease the corner areas of the marginal portion of blank 12 along lines a to e, inclusive, as desired, and to initiate the folding of the same in the manner above described, each of the corner areas of the inclined portion of female die 17 has two pyramidal raised portions 1', 2' and 3', 4'. Preferably, the surface along lines a' and e', which bound the corner areas of inclined walls 22, and line c', which in the form shown bisects said corner area, have the same inclination as said walls, whereas lines b' and d' are inclined at a greater angle with the horizontal. The operative surfaces 1' and 2' of one of the pyramidal raised portions slope downwardly in diverging directions from line or edge b' to lines a' and c', respectively, and surfaces 3' and 4' of the other pyramidal raised portion slope downwardly in the same manner from line or edge d' to lines c' and e', respectively. Line c' is thus the line of intersection of surfaces 2' and 3', and lines a' and c' are the lines of intersection between surface 22 and surfaces 1' and 3', respectively. The angle of inclination of lines b' and d' and hence the lateral slope of surfaces 1', 2', 3' and 4' will of course depend upon the slope of walls 22, said slopes bearing such relation to one another that when the margin 14 of blank 12 has been folded to the full line position shown in Fig. 8, the combined areas of surfaces 1' to 4', inclusive, will accommodate the corner area of said margin without wrinkling the same or placing any portion thereof under tearing pressure.

Folding and stripping die 20 cooperates with female die 17 to bend and conform the margin 14 of blank 12 to the shape of the various inclined surfaces of die 17 above described, and to create the corner areas thereof along lines a to e, inclusive. The lower surface or folding die 20 is machined to cooperate with the upper portion of die 17, the lower face of said folding die being inclined in the same manner as are walls 22 of die 17 and having recesses therein complementary to pyramidal portions 1', 2', and 3', 4'. When die 20 is moved downwardly to the position shown in Fig. 8 with the margin 14 of blank 12 interposed between it and the female die 17, it will be seen that the margin of said blank will be turned up at an angle to the base portion 14 and the corners will be creased and the folding thereof 75
initiated substantially as illustrated in Fig. 3 of the drawing.

For the purpose of completing the corner folds 1, 2, 3, and 4 and for directing or guiding the same into engagement with the adjacent side walls 14 at opposite sides of die 17 of the corner when said walls are drawn into vertical position, a recess 23 extending a short distance on each side of the internal corners of female die 17 is provided. Said recess is bounded by two triangularly shaped walls 24 which have the same direction of slope as walls 14 but such greater degree of slope than said latter walls, and by two walls 25 which are included in planes perpendicular to vertical walls 21 of die 17 and slope downwardly from the extremities of said recess toward the corner of die 17. When either die 18 or 19 is in position to bound the recess 23, a pyramidal cavity is formed in which the corner folds of the container are adapted to be guided and pressed into final position.

Pressing die 19 and footing die 18 are adapted to operate within dies 17 and 20, the dimensions of said pressing die in a horizontal plane being less than those of the footing die by an amount equal to twice the thickness of blank 12. Dies 18 and 19 serve to clamp blank 12 in position and to carry the same downwardly into die 17 whereby said blank is drawn and folded in the manner heretofore described. If desired, groove 16 may be impressed in blank 12 by the operation of die members 19 and 18, the former being provided with a peripheral bead 28 on the face thereof, while the latter has a groove 27 adapted to cooperate with said bead. Groove 27 is preferably sufficiently large to accommodate bead 28 and the material of blank 12 which forms bead 16 so that the central portions of dies 18 and 19 will engage opposite faces of said blank during the flange and corner folding operation to thereby firmly clamp the blank in position.

In the operation of the above described apparatus, blank 12 is placed on top of female die 17 and footing die 18, which latter is normally held in the dotted line position (Fig. 8) by suitable spring means (not shown), the initial position of said blank also being shown by dotted lines in Fig. 8. Pressing die 19 and folding and stripping die 20 are then moved downwardly together, bead 28 of the latter first engaging blank 12 to form groove 14 on the base portion 13 of the blank. Upon further downward movement of the pressing and folding dies, footing die 18 is also forced downwardly and marginal portion 14 of blank 12 is drawn toward a vertical position within female die 17. When the parts have reached the full line positions shown in Fig. 8, margin 14 of the blank is clamped between folding die 20 and female die 17, whereby the corner areas a, e of said margin are definitely creased along lines a to e, inclusive, and the entire marginal portion is turned up to substantially the position illustrated in Fig. 3. Folding die 20 is thenupon withdrawn (Fig. 9) to free margin 14 of the blank as pressing die 19 continues its downward movement, drawing flanges 14 into vertical position between die 19 and the vertical walls 21 of die 17. The continued downward movement of the pressing and footing dies and consequently drawing of flanges 14 causes creases a, c and e to move naturally into substantial coincidence in a substantially vertical position directly above the corner of base area 15, which movement in turn causes the leading edges b or creases b and d of folds 1, 2 and 3, 4, respectively, to engage the side walls of pressing die 19 on each side of a corner thereof. As the folds 1, 2 and 3, 4 are drawn into the pyramidal recess 23, the same are thus guided by die 19 in diverging directions and are finally pressed into engagement with walls 14 as shown in Fig. 5. Due to the slope of walls 24, each increment of downward movement in turn the folding of the flanges is completed resulting in the application of a lateral outward pressure against the corner folds. Simultaneously with the application of such pressure, heat may also be applied to the folded portions by suitable heating means 26, such as steam conduits or electric heating elements, which may be placed in either or both of the die members 17 and 19. The thermoplastic adhesive which is placed on portions of the corner areas of the blank prior to the folding operation, as heretofore described, becomes tacky by the application of said heat and the pressure causes the same to flow into the pores and crevices of the material and weld the engaging surfaces of the folds and side walls together. Upon the retraction of pressing die 19, the upper edge of the side walls 14 of the container engages the lower edge of the forming and stripping die 20 which serves to strip the completed container from the pressing die. The container is thereafter removed and another blank is inserted, either by hand or by suitable well known mechanism (not shown).

There is thus provided a novel method of forming, from a blank of fiber or like material, a container having angular corners and seamless side walls integral with the base portion or bottom thereof, said side walls thus being impervious to air and moisture and also leak-proof. The novel method of folding the corners of said blank also results in the formation of a reinforced corner structure. There is also provided novel means for practical said method, which means is inexpensive and lends itself readily to large scale production.

Although only one embodiment of the invention has been illustrated and described, it is to be expressly understood that the same is not limited thereto but that various sizes and shapes of articles or containers may be made by the method comprehended. It will also be understood that the corner folds 1, 2 and 3, 4 may be folded to engage the outer surfaces of walls 14, if desired. Various changes may also be made in the means employed in carrying out the method of the invention, as will now be apparent to those skilled in the art. Reference will be primarily had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. The method of making a flanged article from a blank which consists in drawing the marginal portion of the blank to form a flange and define a rectangular base area, the flange then being adapted to form four side walls of the article, drawing the portions of the flange intermediate each side wall along five lines radiating from each corner of the base area to form two triangular folds at each corner, and simultaneously welding together the material of each fold and the fold to the side wall to form reinforced and seamless corners.

2. The method of making a container which comprises subjecting a blank to the action of cooperating male and female die members whereby the marginal portion of said blank is progressively drawn into flanged relation with the central portion thereof to form the side walls of the container.
tainer, and simultaneously drawing the corner areas of said marginal portion, said areas being first creased and thereafter drawn to engage said side walls at each side of the corners of said container, while welding the drawn areas to the side wall at each side of the corners of the container.

3. In combination, a female die, a rectangular male die adapted to extend into said female die, and a second male die surrounding said first named male die, said second male die and said female die having coating surfaces for forming folds in a blank at the corners of the latter and said female die having recesses at the corners thereof for receiving the folds formed in the blank by said second male die and the female die.

4. In combination, a female die having an opening with perpendicular side walls therein, a male die adapted to extend into said opening, and a die member surrounding said male die and adapted to move relatively thereto, said die member and female die having coating surfaces adjacent the intersection of said perpendicular walls for forming folds in a blank and the walls of said female die being cut away adjacent said intersection to provide a recess for receiving the folds formed in the blank by the coating surfaces of said die member and female die.

5. In combination, a female die, a male die adapted to be moved to draw a blank into said female die, and a die member surrounding the male die, said die member and female die having coating surfaces for forming triangular folds in said blank and said female die having portions of the walls thereof cut away to provide a recess for receiving said folds as the male die moves into the female die.

6. The method of making a flanged article from a blank which comprises drawing a marginal portion of the blank to form a flange having an angular corner and forming adjacent side walls of the article, drawing the portion of the flange adjacent said corner along five lines radiating from the base of said corner to form two triangular folds, and simultaneously pressing the adjacent surfaces of each fold together and the folds against the side walls to form reinforced and seamless corners.

7. The method of making a container which comprises subjecting a blank to the action of cooperating male and female die members whereby a marginal portion of said blank is progressively drawn into flanged relation with the central portion thereof to form the side walls of the container, and simultaneously drawing a corner area of said marginal portion, said corner area being first creased and thereafter drawn to engage said side walls at each side of an angular corner of the container.

8. The method of forming a container from a blank which comprises applying a thin, dry film of thermoplastic material having adhesive properties to said blank, drawing the blank into the desired shape, simultaneously drawing portions of the blank into overlapping relation, and applying heat and pressure to said overlapping portions for activating said thermoplastic material and pressing the same into the interstices of the engaging surfaces of said overlapping portions.

9. The method of forming a container, having a bottom and side walls, from a blank comprising fibrous materials which includes applying a thin, dry film of thermoplastic adhesive to portions of said blank, die drawing the blank to form said side walls and to overlap portions of the latter, and applying heat and pressure to the side walls for activating said adhesive and pressing the same into the interstices of the overlapping portions of said side walls.

GEORGE ARLINGTON MOORE.