FLAT-BOTTOM PLASTIC BAGS

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ABSTRACT

A flat-bottom plastic bag produced from an extruded length of gusseted thermoplastic material which can be snapped open, as is customary in bagging operations, will have self-sustaining walls, and will remain erect, resting upon its flat bottom, during the filling operation.

2 Claims, 15 Drawing Figures
FLAT-BOTTOM PLASTIC BAGS

The present application is a division of co-pending application, Ser. No. 2,020, filed Jan. 12, 1970, now U.S. Pat. No. 3,606,822 and titled "Method and Apparatus for Producing a Flat-Bottom Plastic Bag".

This invention relates to a novel bag produced from suitable thermoplastic material having inherent heat-sealing characteristics, such as polyethylene, polypropylene, and the like, and to the method of manufacture thereof.

Essential requirements of bags of the character with which we here are concerned are that the bags must include a substantially rectangular and flat bottom surface and the gauge or thickness of the thermoplastic sheet material employed must be such that the bag walls will be self-sustaining and the bag will stand erect, resting upon its flat bottom, when in opened position.

An important end use of such bags is as a carry-out bag for the replacement of paper bags commonly used in the grocery and supermarket industries. Present practices in these fields require that the paper bags utilized be of double-walled manufacture, or that two bags be employed, one inside the other, to eliminate the hazards of bottom breaks occasioned by overloading, wet groceries, and other influences that provide stresses of conditions beyond the tolerance of the paper utilized. Mounting costs in connection with the provision of paper carry-out bags which will withstand satisfactorily the adverse conditions referred to hereabove present continually increasing problems and the present invention is directed to the solution thereof.

It is a major object of the present invention to provide a plastic bag which will be moisture-proof and will have adequate wall strength to withstand internal stresses when the bag is loaded.

It is a further object of the present invention to provide a novel plastic bag having a flat, substantially rectangular bottom surface, whereby the bag may be opened readily and will stand erect to permit the convenient utilization thereof along a check-out and filling line.

A still further object of the invention is the production of a bag of the character with which we here are concerned from a continuous length or tube of heat-sealable thermoplastic material which has been extruded and flattened to provide a Gusset in each side edge thereof, external transverse sealing and severance between adjacent bags being accomplished after the formation of such gussets.

It is an additional important object of the invention to provide a bag of the character under discussion which may be produced with particular economy, can compete successfully with prior-art paper bags and can be used with particular facility in grocery and supermarket operations and the like.

Such bags have numerous other advantages since these may be produced from transparent stock whereby the purchaser and the employee may see each item placed therein, thereby speeding up the check-out operation and, when emptied, these bags may function for the disposition of debris, of whatsoever character, with great advantages over paper bags when used for such purposes.

Further objects and advantages of the invention will be readily apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of a partially opened plastic envelope or tube produced from an extruded length of thermoplastic seamless tubing having a gusset in each longitudinal edge thereof and heat sealed transversely across the full width thereof, including the opposed gussets, to provide a sealed bottom edge;

FIG. 2 is a perspective view of the sealed tube of FIG. 1, illustrating a first step in the production of the flat bottom plastic bag of the present invention;

FIG. 3 is a perspective view of the sealed tube, similar to FIG. 2, illustrating the second step in the production of the flat-bottom bag of the present invention;

FIG. 4 is a perspective view of the sealed tube, similar to FIGS. 2 and 3, illustrating the third step in the production of the flat-bottom bag of the present invention;

FIG. 5 is a perspective view of the finished bag in partially opened condition;

FIG. 6 is a fragmentary sectional view on an enlarged scale taken on the line 6—6 of FIG. 3;

FIG. 7 is a fragmentary sectional view, also on an enlarged scale, taken on the line 7—7 of FIG. 4;

FIG. 8 is a fragmentary perspective view illustrating one form of clamping or grasping mechanism operable to move the lower portion of the tube from the position illustrated in FIG. 3 to that of FIG. 4;

FIG. 9 is a fragmentary perspective view illustrating the clamping mechanism and lower portion of the tube moved to the position illustrated in FIG. 4 of the drawings;

FIG. 10 is a side elevational view, parts being broken away, of the bag grasping and moving mechanism;

FIG. 11 is a side elevational view, a portion being broken away, of an open, flat-bottom bag in accordance with the present invention;

FIG. 12 is a fragmentary bottom plan view of the bag of FIG. 11, a portion thereof being broken away for purposes of clarity;

FIG. 13 is a detail sectional view, on a slightly enlarged scale, taken on the line 13—13 of FIG. 11, looking in the direction of the arrows;

FIG. 14 is a horizontal sectional view, taken on the line 14—14 of FIG. 11, looking in the direction of the arrows; and

FIG. 15 is a fragmentary side elevational view, similar to FIG. 11, illustrating the overlapping folded portions immediately adjacent the flat bottom of the bag in partially pulled apart relationship.

As shown in the drawings, particular reference being had to FIG. 1, the tube 10 of the present invention has been heat-sealed transversely along the bottom edge and severed from a length of seamless thermoplastic tubing produced by an extrusion process and flattened as is well known in this art. The severed bag includes a front wall 11 and a rear wall 12 united along the longitudinal edges thereof by gussets 13 and 14 also as is well known in this art. The thermoplastic material is heat-sealed transversely, from edge to edge thereof as indicated at 15, and severed immediately beyond the seal 15, thereby providing a bottom closure for the initial bag and an open mouth edge for the next adjacent bag, the invention contemplating the successive production of bags from a continuous length of tubing. It will be noted that the transverse seal 15 completely unites or welds the bottom edges of the front and rear walls or panels 11 and 12 to each other and that this seal also includes the gusseted portions 13 and 14. Thus, in the central portion of the sealed tube there are two layers of thermoplastic material, constituting the front and rear walls of the bag; however, in the outer portions of the seal 15 there are four layers of thermoplastic material, the two opposed layers of each gusset 13 and 14 being sealed between the front wall 11 and the rear wall 12.

The bottom-sealed bag 10 is then placed upon a supporting plate or platform 16, as shown in FIGS. 2, 3, and 4 of the drawings, and a pair of forming plates 17 and 18 are positioned in each of the gussets 13 and 14. Each of these forming plates is of substantially trapezoidal configuration and, desirably, the length of the forming plate 18, as defined by the outer edge 18a, is of substantially greater extent than the forming plate 17 as defined by the edge 17a. Further, each forming plate 17 includes an angularly disposed inner edge 17b having an angular relationship of the order of 45° to the transverse edge of the plate 17 and each forming plate 18 has a complementarily located and angularly disposed inner edge 18b, the forming plates 17 and 18 being positioned within the gusset with the angularly disposed edges 17b and 18b in opposed relationship for a purpose to be described more fully hereinafter. The location or positioning of each forming plate 17 is at the base of the associated gusset with the edge 17c in sub-
stantially direct contact with the line of seal between the gusset and the front and rear walls or panels 11 and 12 of the bag. The dimensions of each of the forming plates are critical, particular reference being had to the extent of the edge 17a thereof. As shown more particularly in FIGS. 3, 8 and 9 of the drawings, a single clamping plate 19 is positioned adjacent to the top of the bag and this clamping plate overlies both of the opposed forming plates 18. Thus, when pressure is applied to the upper surface of the clamping plate 19, it being understood that the platform 16 is supported in fixed position, that portion of the bag 10 that is beneath the clamping plate 19 and extending to the open mouth thereof and also including the forming plates 18 will be retained firmly in position and any possibility of movement or distortion in any direction will be precluded. Further, the edge 19a of the clamping plate 19 is positioned immediately adjacent the base of the angularly inclined edge 18b of the forming plate 18.

A separate clamping plate 20 is utilized for each of the forming plates 17 and preferably, desirably, the extent or dimension of each of the clamping plates 20, as defined by the edge 20a thereof, is identical to that of the edge 17a of each forming plate 17. Thus, when pressure is applied simultaneously to the upper surface of the clamping plate 20 and the lower surface of the forming plate 17, the front wall 11 of the bag and the upper portion only of the associated gusset will be grasped securely and retained therebetween.

Any suitable form of clamping means may be provided and appropriate mechanism has been illustrated diagrammatically in FIGS. 8 through 10 of the drawings. As shown in FIG. 8 of the drawings, opposed arms 21, one located at each side of the platform 16, supported upon posts 21a associated with hydraulic cylinders or the like 21b, may be employed to exert downward pressure upon the clamping plate 19 and securely retain the bag between the clamping plate 19 and the platform 16. In this figure of the drawings, the solid lines disclose the arm 21 in locked position while the broken lines disclose the arm 21 in elevated position with clamping pressure having been removed.

A slighter different form of clamping mechanism is required in connection with the clamping plates 20 and forming plates 17 where manipulative steps with movement of the bottom portion of the bag are required. One form of such mechanism may include a horizontally disposed arm or lever 22 including a vertically disposed portion 22a terminating at the lower extremity thereof in a supporting flange portion 22b. Pressure fingers, or the like, 22c, are slidably mounted upon the vertically disposed portion 22a and a hydraulic cylinder 22d and piston 22e may be employed for moving the pressure fingers from upward disengaging position to lowered clamping position. It will be understood that the flange portion 22b is inserted beneath the forming plate 17 and that when pressure is applied to the upper surface of the clamping plate 20 by the pressure fingers 22c, the front wall 11 of the bag and the upper portion of the associated gusset will be firmly grasped and retained between the plates 17 and 20.

A continuous manufacturing process is contemplated where the extruded, gusseted, and flattened tube will be fed to a sealing and cleaning station and each sealed and severed bag will be delivered to a bag bottom forming station where the bag will be delivered to the platform or table 16, the forming and clamping plates 17 through 20 will be positioned automatically and the clamping devices 21 and 22 will be activated to operative engagement with the bag.

At this point it is required only that the bottom portion of the bag be moved longitudinally in a direction toward the open mouth of the bag so as to overlie the lower portion of the remainder of the bag.

It will be understood that there are opposed clamping devices 22. One of these is engaged with a forming plate 17 and a clamping plate 20, the forming plate 17 having been inserted in the gusset 13 and the top wall 11 of the bag 10 and the upper wall of the gusset 13 in the associated gusset portion, and, as the next step in the present process it is required that the clamping devices 22 be moved a slight distance in a vertical direction to a plane immediately above that of the upper surface of the clamping plate 19.

The clamping devices 22 are then moved longitudinally toward the open mouth of the bag to the position shown in FIGS. 4 and 9 of the drawings. This will create fold lines 11a and 11b in the front wall of the bag and a fold 12a in the back wall 12; simultaneously therewith, the bag is provided with a flat bottom constituted by the panel 11c of the bag front wall which extends from the fold 11a to one side of the heat seal 15 and the complementary panel 12c of the bag rear wall which extends from the fold 12a to the opposite side of the heat seal. Triangularly shaped double-layer corner portions 13a and 14a are created simultaneously in each of the gussets 13 and 14 and these corner portions lie in abutting relationship with respect to the panels 11c and 12c that constitute the flat bottom of the bag. The angularly disposed edge 13b of the gusset corner portion 13a is created and determined by contact with the angular edge 18b of the forming plate 18; similarly, the angularly disposed edge 14b of the gusset corner portion 14a is created by contact with the edge 18b of the opposed and associated forming plate 18. The angularly disposed edge 13c of the gusset corner portion 13a is created and determined by contact with the angular edge 17b of the forming plate 17; similarly, the angularly disposed edge 14c of the gusset corner portion 14a is formed by contact with the angular edge 17b of the opposed associated forming plate 17. Upon completion of the folding or bottom-creating operation, pressure upon the clamping plates 19 and 20 is released and the forming plates 17 and 18 are retracted so as to clear the bag and returned to initial position together with the clamping plates 20. Simultaneously therewith, the bag surface clamping plates are lifted slightly and suitable air jets may be employed to move the bag from the former and through properly adjusted nip rolls (not shown) to press or flatten the newly formed folds. It will be understood that stop means (also not shown) may be provided to insure accurate positioning of a sealed and severed bag as it is delivered to the forming station; in like manner, stop means may be provided to limit the longitudinal movement of the clamping mechanism 22.

Particular reference being had to FIGS. 11 through 15 of the drawings, the bag 10, which has been sealed transversely as indicated at 15, is provided with parallel and spaced fold or score lines 31 and 32 extending completely across the bag front and rear walls 11 and 12 respectively. These fold lines are parallel to and equi-distant from the transverse seal 15 and the distance or spacing between the fold lines 31 and 32 is identical to the fully extended width of either of the gussets 13 and 14.

Each of these gussets is provided with a first transverse fold or score line 33, extending completely across the gusset and in alignment with the score lines 31 and 32, grasped and extending and converging fold lines 34 and 35 which meet at the transverse bottom seal 15 and define an area 36 of triangular configuration which overlies the bag bottom and was sealed along its center line 36a when the transverse seal 15 was created.

This structural relationship is shown with particular clarity in FIGS. 13 and 14 of the drawings and it will be observed that the converging fold lines 34 and 35 also serve to define the
edge portions of a companion triangular area 37, identical in size to and overlying the complementarily formed area 36, and terminating in the second transverse fold or score line 38, companion to and overlying the fold line 33 described hereabove, which extends across the full width of the gusset. A third triangular area 39, identical in size and shape to the areas 36 and 37, is formed in each gusset by the converging fold or score lines 40 and 41 which extend from the opposed extremities of the transverse fold line 38. The apex of the triangular area 39 meets the fold or score line 11b which extends completely across the wall 11 of the bag and, as illustrated more clearly in FIG. 5 of the drawings, this third triangular area and associated fold line 11b is essential to permit the flat-bottom plastic bag with which we here are concerned to be packaged for convenient handling and shipping. The transverse fold line 11b extends across the front wall 11 of the bag, as well as the contiguous portions of the gussets 13 and 14, and is parallel to the fold line 31 and spaced therefrom a distance identical to half the extended width of each gusset. When the bag is opened, and stands erect upon its flat bottom, it will have a rectangular cross-sectional configuration with front, rear, and side walls, the width of each side wall being determined by the fully extended width of the gusset from which the side wall is formed.

In brief review, it will be observed that three contiguous and identically formed triangular areas 36, 37, and 39 are required in each gusset. The first of these is sealed along a median line to the bag front and rear walls by the transverse bottom seal 15 and, when the bag is in flat and folded position, the first and second of these three triangular portions are disposed in abutting and overlying relationship. When the bag is opened, only the third and uppermost triangular portion aligns with the expanded bag wall.

The plastic bag will have greater strength, complete resistance to rupture under stresses vastly in excess of those to be expected under normal conditions, and will be fluid-proof as against both internal and external adverse influences. Bags of this character may be manufactured with equal facility through a particularly wide range of sizes with appropriate adjustment of the apparatus to compensate for bag width, length and gusset depth.

It will be obvious, to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof. Thus, the invention is not considered limited by that which is shown in the drawings and described in the specification and reference is had to the claims for summaries of the essentials of the invention, novel features of construction, and novel methods of operation, for all of which protection is desired.

What is claimed is:

1. A flat-bottom bag produced from a length of flattened heat-sealable tubular material having front and rear walls united along each longitudinal edge by a gusset; a transverse seal extending transversely of said length to provide a bag having a closed bottom and an open mouth; a first fold line extending across the bag front wall spaced from and parallel to said transverse seal and a complementary parallel and spaced fold line extending across the rear wall of said bag, the spacing between said fold lines being identical to the fully extended width of the bag gusset; a first transverse fold line extending across each gusset in substantial alignment with said front and rear wall fold lines; a first pair of inwardly extending fold lines converging from the extremities of said first transverse fold line to provide a first triangular area in each gusset joined along the median line thereof to said transverse seal; a second pair of inwardly extending fold lines converging from the extremities of said first transverse gusset fold line to provide a second triangular area in each gusset complemental wall and contiguous to said first triangular area, said second triangular area terminating in a second transverse fold line extending across the gusset in overlying relationship with respect to the adjacent first fold line; inwardly converging fold lines extending from the extremity of said second transverse fold line and providing a third triangular area, the apex of said third triangular area being located on the central fold line of the gusset; the front wall of said bag being provided with a second transverse fold line parallel to and spaced from said first fold line a distance equal to one-half of the width of each gusset, said second transverse fold line being in alignment with the opposed apices of said third triangular areas whereby the folded bottom of said bag may lie flat and in contact with said bag front wall.

2. A flat-bottom plastic bag including front and rear walls united along each pair of longitudinal edges by an inwardly directed gusset and provided with a transverse seal extending therefrom to provide a closed bottom and an open mouth, each gusset constituting a side wall of said bag; a first fold line extending across the bag front wall, said first fold line being parallel to and spaced from said transverse seal a distance equal to one-half of the width of each gusset, said second transverse fold line being in alignment with the opposed apices of said third triangular areas whereby the folded bottom of said bag may lie flat and in contact with said bag front wall.

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