This invention relates to a method of making a liner bag for a package. The invention has for an object to provide a novel and improved method of making a liner bag having an overlapping side seam and a folded bottom closure wherein novel provision is made for sealing the side seam and the bottom closure in a manner such as to produce a leakproof and airtight bag.

With this general object in view, and such others as may hereinafter appear, the invention consists in the method of making a liner bag as hereinafter described and particularly defined in the claim at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention:

FIG. 1 is a perspective view illustrating a sheet of liner bag forming material wrapped about a forming block and provided with a longitudinal overlapping side seam heat sealed to form a tubular structure;

FIG. 2 is a similar view showing the extended portions of the tube being folded to provide a bottom closure;

FIG. 3 is an end view showing the completely folded bottom closure;

FIGS. 4 and 5 are similar views of the folded bottom closure showing the preferred sealing pattern employed to produce a leakproof bottom closure;

FIGS. 6 and 7 are enlarged cross sectional views of the heat sealed side seam taken on the line 6—6 of FIG. 2;

FIGS. 8 and 9 are similar views of an outer bag wrapped about the forming block and the liner bag; and

FIG. 10 is a perspective view showing the completely lined bag.

In general the present invention contemplates a novel and improved method of making a liner bag for a package wherein the liner bag may comprise a relatively thin thermoplastic sheet material, such as "Pliofilm," preferably transparent, and capable of being heat sealed by the application of heat and pressure to overlapping portions thereof. In the illustrated embodiment of the invention the thermoplastic sheet material is wrapped about a forming block with the longitudinal marginal edges of the sheet arranged in overlapping relation, such marginal edges being sealed together along relatively narrow spaced lines by the application of heat and relatively slight pressure to form a tube. A portion of the tube extends beyond the outer end of the forming block for bearing the bottom closure, and opposed walls of such extended portion are folded inwardly against the bottom of the block in overlapping relation. Each inwardly folded wall of the extended portion forms a tapering or trapezoidal shaped flap connected by triangular shaped gussetlike folds which overlie the first folded flaps and underlie the last folded flaps. In accordance with the present invention the folded and overlapping portions of the bottom closure are heat sealed along predetermed spaced lines in a novel pattern such as to provide an airtight bottom closure.

The present liner bag is adapted to be produced on a high speed packaging machine, known in the trade as a "double package maker," wherein the liner bag is formed by wrapping the sheet about the forming block and sealing the overlapping portions of the side seam at one station of operation; folding and sealing the bottom closure at a second station of operation; wrapping an outer bag or carton about the forming block and its liner bag; and sealing the side seam of the outer at a subsequent station; and folding and sealing the bottom closure of the outer bag at another station, the completed lined bag or package being then stripped from the forming block ready to be filled and provided with a top closure.

Referring now to the drawings, 10 represents a relatively thin sheet of flexible thermoplastic or other thermo-responsive liner bag material, overlapping portions of which are capable of being fused together upon the application of heat and relatively slight pressure. In producing the bag, as shown in FIG. 1, the liner sheet 10 may be wrapped about a horizontally extended forming block 12 to form an elongated tubular structure rectangular in cross section, the longitudinal marginal edges 14, 16 of the sheet being brought together in overlapping relation and sealed along two relatively narrow spaced lines 18, 20 by the application of heat and pressure to provide a longitudinally extended double line side seam disposed substantially medially of the side walls of the tube, as indicated at 22. In practice the double line seam 22 may be produced by an elongated heat sealing bar 24, as shown in FIG. 6, provided with two spaced relatively narrow elongated sealing projections or ridges 19 and 21 and which cooperate with a resilient portion of the forming block which may comprise an insert 26 of rubberlike material capable of withstanding heat. The heat sealing operation effects softening and flowing together of the thermoplastic material of the overlapping portions to form the fused or welded line seals 18, 20. In practice the sealing ridges of the bar 24 and the cooperating resilient insert 26 in the forming block 12 may be coated with a suitable antistick material to prevent sticking of the softened material to the sealing elements.

During the operation of wrapping the liner sheet about the forming block, opposed folding elements 28, 30 are operated in sequence to fold the marginal portions of the sheet across the upper surface of the horizontally extended block in a manner such as to arrange the marginal portions in overlapping relation, and in operation the folding elements 28, 30 remain at rest in the position shown in FIG. 6. To retain the edges of the sheet in overlapping relation during the heat sealing operation, it will be observed that the liner sheet 10 extends beyond the outer end of the block to provide extended wall portions for forming the bottom closure at a subsequent station of operation. It will also be observed that the double line side seam 22 extends to the outer end of the forming block, the side seam terminating substantially at the corner of the block at the point indicated at 32, leaving the overlapping portions 34 of the extended wall free or unsealed. However, in operation the sealing bar 24 extends a short distance beyond the edge of the block so that in practice the side seam extends a short distance beyond the end of the corner of the block.

Thereafter, the opposed walls of the extended end wall portions of the tube are folded inwardly against the end of the forming block in overlapping relation in a predetermined sequence to form the bottom closure as illustrated in FIGS. 2 and 3. In practice the upper and lower extended end walls are first folded inwardly simultaneously against the end of the forming block by suitable folding elements to provide tapering or trapezoidal shaped flaps 36, 38, respectively. Then, the remaining opposed extended end walls are folded inwardly against the end of the forming block by suitable folding elements to like-
wise provide tapering or trapezoidal shaped flaps 40, 42, respectively, the first folded flaps 36, 38 being connected to the last folded flaps 40, 42 by triangular shaped gusset-like folds 43 which overlie the first folded flaps and underlie the last folded flaps as illustrated. It will be observed that the ends of the first folded flaps are spaced apart in the completed bottom fold, then fold the last folded flaps are folded in a sequence such that the end of the flap 42 overlaps a portion of the end of the flap 40 as shown.

It will be observed that the tapering flaps and the gusset-like connecting portions are open at their outer ends and that the last folded flaps 40, 42 overlie portions of the first folded flaps 36, 38. As illustrated in FIG. 8, the transverse seals may be produced by a sealing pad 64 having a pair of upper sealing ridges 65, 66 and a pair of lower sealing ridges 67, 68 which also cooperate with the resilient insert 50 provided in the end of the block. The transverse sealing operation also serves to fuse the multi-layer peace of the bottom gusset 43, to produce an air tight closing off any leakage between the flaps 36, 38 and the overlapping portions of the closure. As shown in FIG. 8, the cross section is taken at a point wherein the upper transverse seal fuses together the underlying flap 36, intermediate gusset portion 43 and overlying flap 42, and the lower transverse seal fuses together the underlying flap 38, intermediate gusset portion 43 and the overlying flap 42.

It will be seen that the folded and sealed bottom closure thus defined provides an air tight and leakproof seal, each seal comprising a double line seal bonding or welding together an area intermediate the ends of the flaps, each flap being sealed to adjacent underlying and overlying portions of the folded closure. While it is preferred to use double line seals, as shown, the invention also contemplates single line seals in the areas defined. In the illustrated embodiment of the invention each of the seal lines are preferably about 3/4 of an inch in width and where double lines are used are spaced apart from 1/8 to 3/8 of an inch. Relatively narrow line seals are used in preference to relatively wider sealed areas or lines because a greater concentration of heat may be applied along the narrow lines to quickly fuse the overlapping plies together, while the sealing elements are provided with an antistick coating it has been found that more difficulty is encountered in preventing sticking of the softened thermoplastic material to wider sealing elements. Also, a relatively wide heat seal is more subject to the formation of air bubbles between the overlapping plies such as to form imperfect seals. Since more uniform contact between the sealing element and material may be attained with a narrow sealing element air bubbles between the plies are eliminated, and the use of a double line seal further assures an air tight seal.

As shown in FIG. 7, the outer sheet 70 of bag material may be wrapped about the bag thus produced may be delivered to a filling machine where the product to be packaged is deposited in the lined bag.
The filled bag may then be provided with a top closure in any usual or preferred manner to provide an airtight top closure seal. The illustrated lined bag shows the top or mouth of the liner bag flush with the top or mouth of the outer bag, and in practice this type of bag is adapted to be provided with a bellows or gusset type fold and heat sealed by the application of heat and pressure to seal the contacting mouth portions of the thermoplastic liner bag in airtight relation. A modified type of top closure may include a line seal across the flattened mouth of the thermoplastic liner bag. It will be understood that the present liner bag may also be used with advantage as a liner in other types of packages, such as a liner for a carton provided with the usual adhesively secured top and bottom closure flaps.

The illustrated package when provided with a "Pliofilm" liner bag having airtight seals, as described, is particularly adapted for use as a container for ground coffee. One of the known characteristics of the "Pliofilm" material is that it has some degree of porosity. Thus, any increase in pressure within the sealed liner bag caused by gas generated by the coffee may slowly escape through the bag material, and such pressure within the bag will prevent air from the atmosphere from entering the bag, thus maintaining the coffee in fresh condition. However, the present invention also contemplates bags made from other materials which may be non-porous and when sealed as described will provide a hermetically sealed container.

While in the foregoing description the liner bag has been described as formed from a sheet of thermoplastic or thermoreponsive material it will be understood that other sheet materials may be used, and such materials coated in the predetermined areas to be sealed with heat and/or pressure sensitive adhesives such that the liner bag may be sealed along the predetermined seal lines as herein described.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claim.

Having thus described the invention, what is claimed is:

The method of producing a liner bag which comprises the steps of folding a rectangular sheet of thermoplastic bag forming material about a rigid forming block having resilient portions with the longitudinal marginal edges of the material in overlapping relation to form a rectangular tube with one end of the tube extended beyond the end of the forming block, applying heat and relatively slight pressure along two spaced relatively narrow lines to the overlapping marginal edges in cooperation with the resilient portions of the block to provide a fused airtight side seam extending from the inner end of the tube to a point slightly beyond the outer end of the block leaving the remainder of the extended overlapping side seam portions unsealed in the partially completed bag, folding opposed end walls of the extended end of the tube inwardly against the end of the block to provide a bottom fold having trapezoidal shaped flaps and having portions in overlapping relation and connected by intervening triangular gusset folds forming multi-ply portions, the ends of the last folded flaps arranged in overlapping relation, applying heat and relatively slight pressure along two relatively narrow spaced lines parallel to the outer ends of said last folded flaps in cooperation with the resilient portions of the block to fuse said flaps together and to the underlying portions of the first folded opposed flaps and the gusset folds in airtight relation, said parallel spaced lines terminating a short distance beyond the multi-ply portions of the bottom fold, then applying heat and relatively slight pressure along two pairs of relatively narrow spaced lines simultaneously in cooperation with said resilient portions, said pairs of spaced lines being arranged intermediate the ends of each of said first folded flaps and intersecting the lines sealing the first folded flaps to fuse the latter to the overlying last folded flaps and the gusset folds in airtight relation to provide an airtight bottom closure, one pair of said spaced lines being coextensive with the extended portions of said side seam seal lines, said two pairs of narrow seal lines also terminating a short distance beyond the multi-ply portions of the bottom fold.

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