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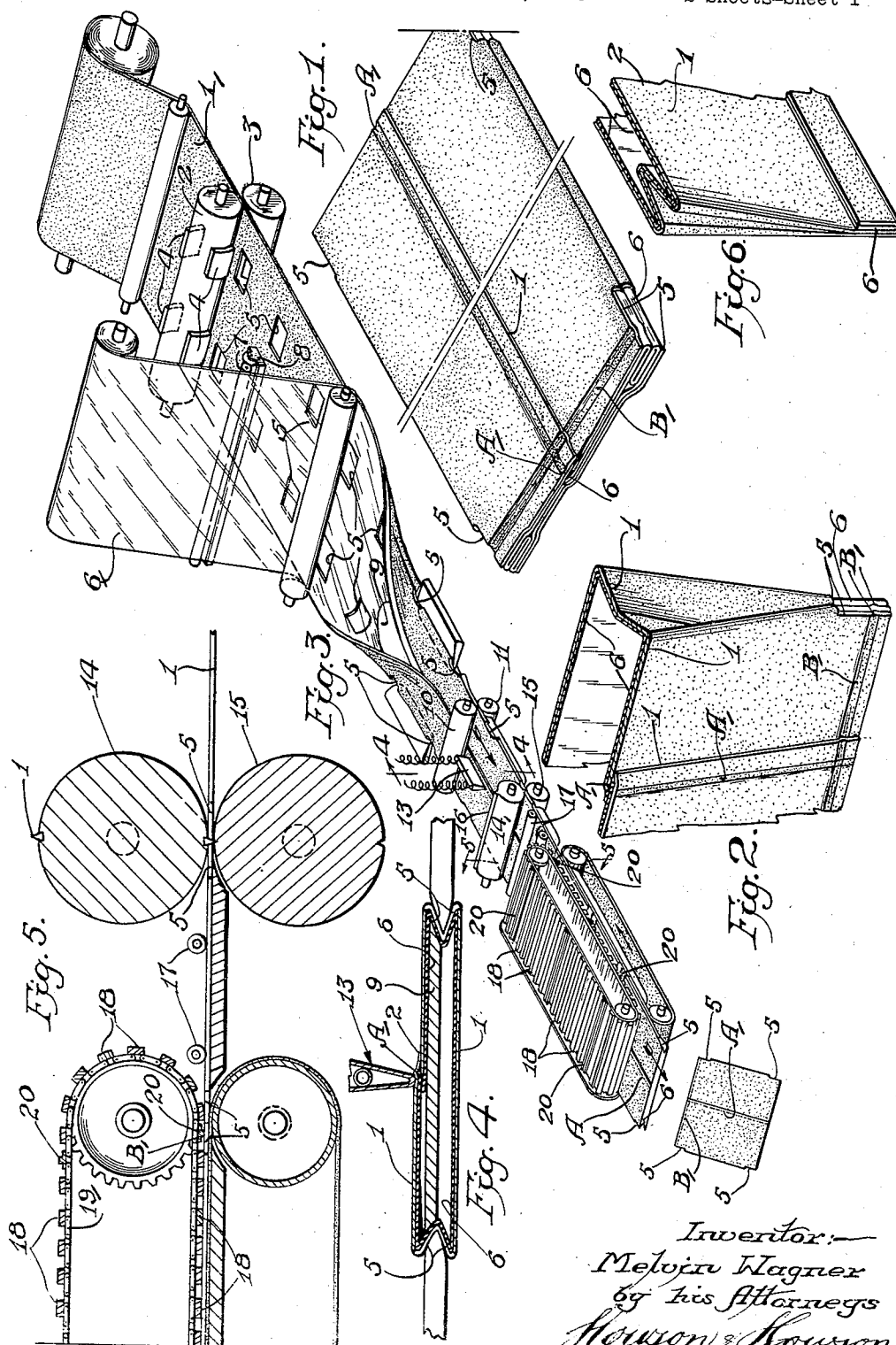
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METHOD AND APPARATUS FOR MAKING BAGS

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METHOD AND APPARATUS FOR MAKING BAGS

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10 Claims. (Cl. 93—35)

This invention relates to new and useful improvements in methods and apparatus for making bags. The invention relates more particularly to a method and apparatus for making multiple ply bags having bellows-folded side walls, all seams of which are formed by the fusion of surfaces of the inner ply to each other, and is a continuation in part of my application Serial No. 283,275, filed July 7, 1939, which application is a division of application Serial No. 237,736, filed October 29, 1938.

During the past year or so the bag industry has given particular attention to the sealing or securing of the seams and bottoms of bags by the application of heat to effect a fusion of the surfaces of the bag material in desired regions or areas, and such methods have proven highly satisfactory in the case of bags of the type of the so-called flat bag which has no reentrant folds. In the case of multi-ply bags having so-called bellows-folded side walls, this method of sealing the bottoms of such bags has been wholly unsuccessful due to the fact that the bellows side walls, being reentrant folds, introduce the outer ply or plies of material between opposite surfaces of the innermost fusible or thermoplastic ply thus causing a gap or pin hole to occur in the opposite interior wall surfaces at the termination of these reentrant or bellows-folded portions and making it impossible to obtain a tight end joint.

With the foregoing in mind, the principal object of the present invention is to provide a satisfactory and efficient method and apparatus for making a bellows-folded multi-ply bag wherein all of the seams are secured by fusion of the innermost ply.

Another object of the present invention is to provide a method and apparatus for making a bag of the type described wherein the introduction of the outer plies between opposite faces of the inner ply at the end joint of the bag is prevented.

These and other objects of the invention and the features and details of the construction and manufacture thereof are hereinafter fully set forth and shown in the accompanying drawings, in which:

Figure 1 is a view in perspective of a multi-ply bag having bellows-folded side walls made according to the present invention.

Figure 2 is a fragmentary view in perspective showing such a bag open with the bellows side walls in expanded relation.

Figure 3 is a diagrammatic view in perspective

illustrating the method by which the bag shown in Figures 1 and 2 may be manufactured.

Figure 4 is an enlarged view in section taken on line 4—4, Figure 3.

Figure 5 is an enlarged fragmentary view in section taken on line 5—5, Figure 3.

Figure 6 is a fragmentary view in perspective illustrating a manner in which the heat-sealed bottom or top end of the bag may be foldably manipulated.

Figure 7 is a diagrammatic fragmentary view in perspective of certain modifications of the method disclosed in Figure 3.

Figure 8 is an enlarged view in section taken on line 8—8, Figure 7; and

Figure 9 is an enlarged fragmentary view in section taken on line 9—9, Figure 7.

Referring now more particularly to Figure 3 of the drawings, in practicing the present invention, a web of paper or other flexible material 1 of any desired width is drawn from a supply roll and between a pair of opposed rolls 2 and 3, the upper roll 2 of which is provided with suitably located cutting or punching dies 4 arranged to cut or punch pairs of square or rectangular openings 5 in said web 1 at predetermined intervals therealong. It is important to point out at this time that the pairs of openings 5 are formed in the web 1 and spaced therealong so that the transverse axes of adjacent pairs of said openings 5 are spaced apart a distance longitudinally of the web 1 equal to the length of bag desired. It is further pointed out that the transverse width of the openings 5 of each pair is equal to twice the depth of the reentrant folds provided by the bellows side walls to be formed and these openings 5 of each pair are spaced relative to each other and the web 1 transversely thereof so that when the bellows-folded bag tube is later formed none of the material of the web 1 resides at the bellows-folded reentrant portions in the region of the bottom or top end joint area of the bag to be formed.

After the formation of the openings 5 as above described, a web 6 of heat-fusible or thermoplastic material, such as "Pliofilm," or the like, of width corresponding to that of the web 1 is drawn from a supply roll and, adhesive having been applied or introduced therebetween as, for example, by roll 7 from a paste box 8, the two webs 1 and 6 are duplexed according to any one of several methods commonly employed in the bag industry.

The composite web thus formed is now brought over or around a forming plate 9 of conventional form having the usual tuckers and arranged to

form a tube having reentrant or bellows-folded side walls with the opposite edge portions of the web 6 in overlapping relation along the upper side or face of said tube.

The tube then passes between one or more pairs of press rolls 10 and 11 and then beneath a longitudinally extending heating iron or element 13 which is arranged so as to overlie the lapped seam portions thereof.

The iron or element 13 may be heated in any suitable manner such as electricity and the heat generated therein penetrates through the backing web 1 to cause a permanent fusion of the overlapped edge portions of the heat-fusible or thermoplastic inner web 6 as indicated at A in Figure 1 of the drawings. The thus longitudinally sealed tube next passes between a pair of rolls 14 and 15, the roll 14 of which carries a cutting knife or blade 16 arranged and operable to sever sections from the tube along lines coincident with the transverse axes of each pair of the now covered openings 5 previously described.

The longitudinally sealed tube sections then pass beneath one or more rolls 17 and into a bottom end sealing mechanism which is arranged so as to grip or clamp the leading edge portion of each tube section at or prior to the instant it is severed from the tube. A number of grips or clamps 18 are provided and several of these move through the end sealing mechanism in engagement with each tube section which are supported upon a moving endless belt 19. In addition to the grips or clamps 18 several transverse heating irons or elements 20 are associated therewith, and these are arranged with respect to said grips or clamps 18 so as to engage the rear edge portion of each tube section during travel thereof through this mechanism, the heat from said iron or element 20 penetrating the several layers of material of the composite web to effect a permanent fusion of the adjacent surfaces of the underlying portions of the inner ply of heat-fusible or thermoplastic material as indicated at B in Figure 1 of the drawings.

A modification of the foregoing method is shown in Figures 7, 8 and 9 of the drawings wherein, in forming the tube about the former 9, the opposite edge portions of the heat-fusible inner web 6 are first brought into overlapping relation along the upper side of the tube and heat-sealed together before lapping thereover the edge portions of the paper outer ply 1. This is accomplished by interposing a heating iron or element 10a between the edge portions of the paper outer ply 1 as shown in Figure 8 and said heating element 10a is thus afforded direct contact with the lapped edge seam portions of the heat-fusible inner ply 6.

The reason for adopting this modification resides in the fact that when the inner ply seam is fused by the application of heat thereto through the outer paper ply 1 as first described, the heating iron 10a under which the completely seamed tube is drawn very often leaves a dark brownish line or lines along the surface of the outer paper ply where contacted by said iron. These lines disfigure and detract substantially from the appearance of the completed bags and I have found that the occurrence thereof may be eliminated entirely and an equally effective inner ply seam produced by this method of heat-sealing said inner ply seam prior to lapping thereover the edge portions of the paper outer ply 1.

After sealing the inner ply seam in accordance with this modification, the tube then passes be-

tween a pair of rolls 21 and 22 which operate to bring the edge portions of the outer paper ply or web 1 into lapped relation in which relation they are secured by means of adhesive previously applied to the inner surface of the overlapping edge portion of said web 1 as indicated at 23. The thus longitudinally sealed tube next passes between a pair of rolls 14a and 15a, the former of which carries a blade 16a arranged and operable to sever sections from the tube along lines coincident with the transverse axes of each pair of the now covered openings 5 previously described.

The resulting tube sections then successively pass into a bottom end sealing device or mechanism which, in the present modification of the invention, comprises a number of grip elements 18a arranged to move in cooperative opposing engagement with each of the tube sections, and in addition to these grips 18a, cooperatively opposed heating elements 20a are associated therewith and arranged with respect thereto to engage from opposite sides of the leading edge portion of each tube section and travel therewith through said mechanism, the heat from said elements 20a penetrating the several thicknesses of the sections to effect a permanent fusion of the intermediate portions of the heat-fusible inner ply 6 as indicated at B' in Figure 7 of the drawings.

It will be observed from the foregoing description that by forming the openings 5 in the web 1 in the manner and at the locations previously described none of the backing or material of said web 1 is introduced between the reentrant folds and surfaces of the heat-fusible or thermoplastic web material 6 at the bottom end of the tube or bag thus eliminating the possible occurrence of gaps or holes in the interior wall surfaces at the termination of such reentrant or bellows-folded portions at and adjacent the bottom end of the bag, and making it possible to obtain and secure a tight end joint at the bag bottom. The particular arrangement of the openings 5 in the web 1 also removes the material of that web from the reentrant folds and surfaces of the heat-fusible web 6 at the top open end of the bag, and this is done so that after the bag has been filled it may be tightly closed and sealed at the top end by heat fusion of the surfaces of the web 6, the elimination of the material of the web 1 from the reentrant folds at the top of the bag permitting a tight closure to be obtained for the same reasons set forth above in connection with the fusion of the bottom end of said bag.

After fusion of the bottom end of the bags according to either of the foregoing methods they are discharged from the bottom sealing mechanism at which time their bottom end portions may, if desired, be foldably manipulated and secured by means of adhesive in the relation shown in Figure 6 of the drawings. This same thing may, of course, be done with the top end of the bag after it is filled and heat-sealed in the manner previously described.

From the foregoing it will be seen that the present invention provides a novel method and apparatus for making a bag of the reentrant bellows-folded side wall type having a tight bottom end seal formed by fusion of the surfaces of the inner thermoplastic ply or web which is made possible by the provision of the openings 5 in the web 1 whereby portions of said outer ply of backing material are removed from the region or area of the reentrant bellows folds at the top and bottom ends of the bag with the result that none

of said backing material is introduced between opposite surfaces of the thermoplastic ply 6 at those points, and the occurrence of gaps or holes at the inner edges of the reentrant bellows folds are entirely eliminated.

It will be obvious, of course, that in lieu of cutting sections from the tube prior to fusing the bottom end seam said seams may be fused prior to severing sections of the tube if desired, in which event all that is required to be done is the positioning of the cut-off rolls after, instead of ahead of, the bottom end sealing mechanism. Other details of the manufacture of the bags may be varied as required by shop practice and the construction of the particular bags being made, and while particular details of the construction and practice of the invention have been herein illustrated and set forth, it is not intended that said invention shall be limited thereto, but that changes and modifications may be incorporated and embodied therein within the scope of the annexed claims.

I claim:

1. In the method of making multi-ply bags, the steps comprising forming transversely spaced pairs of openings in a web of paper at predetermined intervals therealong, duplexing a web of thermoplastic material on said paper web, forming the duplex web into tubular form with reentrant bellows-folded side walls which include the transversely spaced pairs of openings in the paper web, the said tubular form having the thermoplastic web residing interiorly thereof with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, supporting the overlying edge portion of said paper outer web remote from the lapped edge portions of the thermoplastic inner web, applying heat directly to said lapped edge portions of said thermoplastic material to fuse the same together while the overlying edge portion of the paper outer web is remotely supported, and then lapping and securing together the edge portions of the paper outer web in overlying relation with respect to the inner web.

2. In the method of making multi-ply bags, the steps comprising forming transversely spaced pairs of openings in a web of paper at predetermined intervals therealong, duplexing a web of thermoplastic material on said paper web, forming the duplex web into tubular form with reentrant bellows-folded side walls which include the transversely spaced pairs of openings in the paper web, the said tubular form having the thermoplastic web residing interiorly thereof with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, deflecting the overlying edge portion of the paper outer web away from the lapped edge portions of the thermoplastic inner web, applying heat directly to said lapped edge portions of said thermoplastic material to fuse the same together while said overlying edge portion of the paper outer web is deflected, lapping and securing together the edge portions of the paper outer web in overlying relation with respect to the inner web, and then applying heat transversely of the tube along lines through said openings in the paper outer web to cause a fusion of the opposing surfaces of the adjacent portions of the thermoplastic inner web.

3. In the method of making multi-ply bags, the steps comprising forming transversely spaced pairs of openings in a web of paper at predetermined intervals therealong, duplexing a web of

thermoplastic material on said paper web, forming the duplex web into tubular form with reentrant bellows-folded side walls which include the transversely spaced pairs of openings in the paper web, the said tubular form having the thermoplastic web residing interiorly thereof with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, deflecting the overlying edge portion of the paper outer web away from the lapped edge portions of the thermoplastic inner web, applying heat directly to said lapped edge portions of said thermoplastic material to fuse the same together while said overlying edge portion of the paper outer web is deflected, lapping and securing together the edge portions of the paper outer web in overlying relation with respect to the inner web, cutting bag sections from the tube transversely thereof along the transverse axes of the openings in the paper outer ply, and then applying heat transversely of said bag sections at one end thereof through said openings to cause a fusion of the opposing surfaces of the adjacent portions of the thermoplastic inner ply.

4. In the method of making multi-ply bags, the steps comprising forming transversely spaced pairs of openings in a web of paper at predetermined intervals therealong, duplexing a web of thermoplastic material on said paper web, forming the duplex web into tubular form with reentrant bellows-folded side walls which include the transversely spaced pairs of openings in the paper web, the said tubular form having the thermoplastic web residing interiorly thereof with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, deflecting the overlying edge portion of the paper outer web away from the lapped edge portions of the thermoplastic inner web, applying heat directly to said lapped edge portions of said thermoplastic material to fuse the same together while said overlying edge portion of the paper outer web is deflected, lapping and securing together the edge portions of the paper outer web in overlying relation with respect to the inner web, cutting bag sections from the tube transversely thereof along the transverse axes of the openings in the paper outer ply, applying heat transversely of said bag sections at one end thereof through said openings to cause a fusion of the opposing surfaces of the adjacent portions of the thermoplastic inner ply, and transversely folding over and securing the thus sealed end of the bags to the bodies thereof.

5. In the method of making multi-ply bags, the steps comprising duplexing a web of paper and a web of thermoplastic material, forming the duplex web into tubular form with the thermoplastic web residing interiorly with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, deflecting said overlying edge portion of the paper outer web away from the lapped edge portions of the inner thermoplastic web, applying heat directly to said lapped edge portions of said thermoplastic web to fuse the same together while the overlying edge portion of the paper outer web is deflected, and then lapping and securing together the opposite edge portions of said paper outer web in overlying relation with respect to the inner web.

6. In the method of making multi-ply bags, the steps comprising duplexing a web of paper and a web of thermoplastic material, forming the

duplex web into tubular form with the thermoplastic web residing interiorly with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, deflecting said overlying edge portion of the paper outer web away from the inner thermoplastic web, applying heat directly to said lapped edge portions of said thermoplastic web to fuse the same together while the overlying edge portion of the paper outer web is deflected, returning the deflected edge portion of the paper outer web to its position overlying the fused lapped edge portions of the thermoplastic inner web, and then lapping and securing together the opposite edge portions of said paper outer web in overlying relation with respect to the inner web.

7. Apparatus for making multi-ply bags comprising means for feeding and duplexing a web of paper and a web of thermoplastic material, means for forming said duplex web into tubular form with the thermoplastic web residing interiorly with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, a member interposed between the lapped edge portions of the inner thermoplastic web and the overlying edge portion of the outer paper web for deflecting said edge portion of the paper web away from said lapped edge portions of the thermoplastic web, and a heating element carried by said member and arranged to apply heat directly to the lapped edge portions of said thermoplastic web to seal the same together while said overlying edge portion of the outer paper web is deflected by the member.

8. Apparatus for making multi-ply bags comprising means for feeding and duplexing a web of paper and a web of thermoplastic material, means for forming said duplex web into tubular form with the thermoplastic web residing interiorly with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, a member interposed between the lapped edge portions of the inner thermoplastic web and the overlying edge portion of the outer paper web for deflecting said edge portion of the paper web away from said lapped edge portions of the thermoplastic web, a heating element carried by said member and arranged to apply heat directly to the lapped edge portions of said thermoplastic web to seal the same together while said overlying edge portion of the outer paper web is deflected by the member, and means for positioning the edge portions of the outer paper web in lapped relation overlying the inner thermoplastic web after sealing of the lapped edge portions of said inner thermoplastic web.

9. Apparatus for making multi-ply bags comprising means for advancing a web of paper and a web of thermoplastic material, means for forming transversely spaced pairs of openings in said paper web at predetermined intervals therealong, means for duplexing the webs of paper and ther-

moplastic material, means for forming said duplex web into tubular form with reentrant bellows folded side walls which include said transversely spaced pairs of openings in the paper web and with the thermoplastic web residing interiorly with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, a member interposed between the lapped edge portions of the inner thermoplastic web and the overlying edge portion of the outer paper web for deflecting said edge portion of the paper web from said lapped edge portions of the thermoplastic web, a heating element carried by said member and arranged to apply heat directly to the lapped edge portions of said thermoplastic web to seal the same together while said overlying edge portion of the outer paper web is deflected by the member, means for cutting bag sections from the tube transversely thereof on a line through the openings in the outer paper web, and means disposed beyond said cutting means for applying heat transversely of said bag sections at one end thereof on a line through said openings to seal together the opposing surface portions of the thermoplastic inner web.

10. Apparatus for making multi-ply bags comprising means for advancing a web of paper and a web of thermoplastic material, means for forming transversely spaced pairs of openings in said paper web at predetermined intervals therealong, means for duplexing the webs of paper and thermoplastic material, means for forming said duplex web into tubular form with reentrant bellows folded side walls which include said transversely spaced pairs of openings in the paper web and with the thermoplastic web residing interiorly with its edge portions extending longitudinally in lapped relation beneath an overlying edge portion of the outer paper web, a member interposed between the lapped edge portions of the inner thermoplastic web and the overlying edge portion of the outer paper web for deflecting said edge portion of the paper web from said lapped edge portions of the thermoplastic web, a heating element carried by said member and arranged to apply heat directly to the lapped edge portions of said thermoplastic web to seal the same together while said overlying edge portion of the outer paper web is deflected by the member, means for positioning the edge portions of the outer paper web in lapped relation overlying the inner thermoplastic web after sealing of the lapped edge portions of said inner thermoplastic web, means for cutting bag sections from the tube transversely thereof on a line through the openings in the outer paper web, and means disposed beyond said cutting means for applying heat transversely of said bag sections at one end thereof on a line through said openings to seal together the opposing surface portions of the thermoplastic inner web.

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