Dec. 9, 1947. E. A. PARDEE 2,432,122

METHOD OF FOLDING AND SEALING SHEET MATERIAL

Filed Jan. 21, 1944

Fig. 1

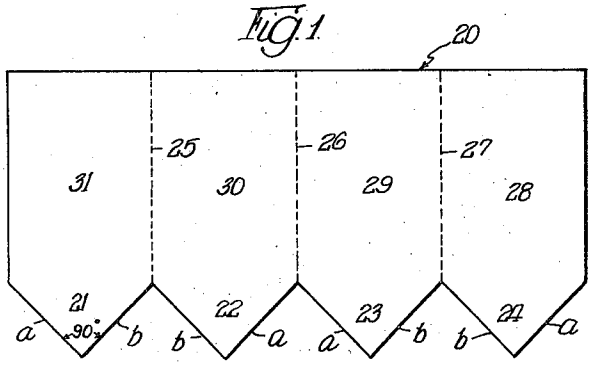


Fig. 2

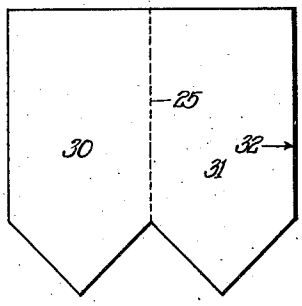


Fig. 3

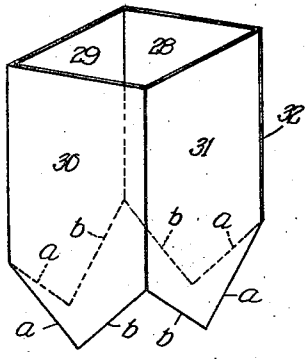


Fig. 4

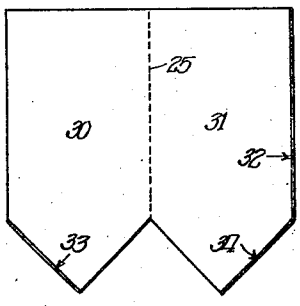


Fig. 5

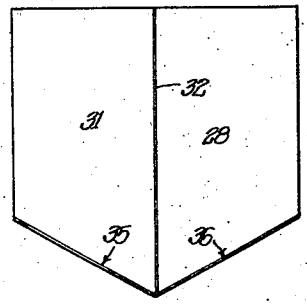


Fig. 6

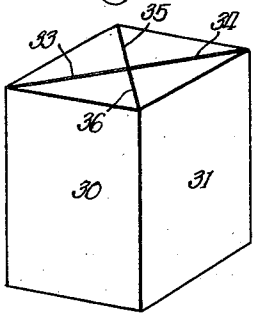


Fig. 7

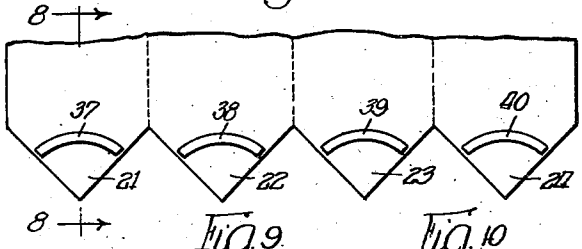


Fig. 8

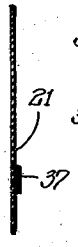


Fig. 9

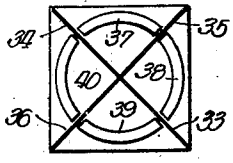


Fig. 10

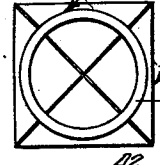
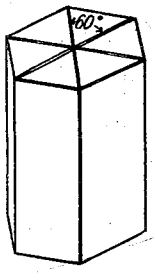


Fig. 11



Fig. 12



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METHOD OF FOLDING AND SEALING SHEET MATERIAL

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Application January 21, 1944, Serial No. 519,134

4 Claims. (Cl. 93—36.8)

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The present invention relates to the fabrication of sheet material into articles such as liners for containers as well as protective covers for various other manufactures, such articles also being useful as receptacles and containers for various packaging purposes.

A principal object of the invention is the provision of such an article and method for its manufacture in which a tubular formation of sheet material has portions removed from one end thereof so that the remaining portions can be converted into a liner, protective cover, or a container with a novel type of flat end closure.

More specifically, it is an object of the present invention to provide an article of the kind herein described which comprises side walls forming a tubular body portion having triangular sections at the base of the side walls projecting inwardly of the body portion toward a common center, each of the sections being sealed to an adjacent section along marginal edges to form a novel type of flat bottom for such an article.

Another object of the invention is the provision of a novel flat bottom article which can be used as a liner for flat walled containers, or as a flat bottom bag.

A further object of the invention is the provision of a novel flat bottom article which can be used as a liner for cylindrical containers, or as a flat bottom bag with cylindrical side walls.

Yet another object of the invention is the provision of an article of the kind herein described which constitutes a square liner or bag having a square flat bottom which can be transformed to a round flat bottom, and the side walls of which can be transformed from square to cylindrical shape in cross section.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others, and the article possessing features, properties, and the relation of elements, which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a plan view of a cut sheet of suitable material folded and sealed to produce one form of article embodying the present invention;

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Fig. 2 is a plan view of the sheet shown in Fig. 1 folded and marginally sealed to itself along one edge;

Fig. 3 is a perspective view of the sealed sheet of Fig. 2 opened up into tubular formation for purposes of illustration;

Fig. 4 is a plan view showing the tube of Fig. 3 again flattened as in Fig. 2 and with the outside marginal portions of its triangular extensions sealed together;

Fig. 5 is a view similar to Fig. 4 in which the walls have been opened up and flattened in an opposite direction depicting the remaining outside marginal portions of its triangular extensions sealed together;

Fig. 6 is a perspective view of the sealed article of Fig. 5 in inverted position illustrating the novel type of flat bottom which results from such sealing operations;

Fig. 7 is a lower fragmentary portion of a sheet of material such as that shown in Fig. 1, having reinforcing segments secured to the triangular sections;

Fig. 8 is a transverse sectional view taken along the lines 8—8 of Fig. 7;

Fig. 9 is a plan view of a sheet such as shown in Fig. 7 completely sealed as illustrated in Fig. 6 showing the novel square bottom formation with the segments secured thereto;

Fig. 10 is a plan view illustrating a modified form of reinforcing and forming element subsequently applied to a square bottom formation after sealing;

Fig. 11 is a fragmentary portion in section taken along the lines 11—11 of Fig. 10; and

Fig. 12 is a perspective view of a multi-walled tubular formation illustrating a further modification of the invention and the resulting novel flat bottom obtained thereby.

Referring more particularly to Fig. 1 of the drawing, there is illustrated generally at 20 a single web of sheet material for fabricating articles of the type herein described. It should be noted that while a single sheet of material is here shown, largely for purposes of illustration, any number of single panels can be secured together, particularly where the ultimate article is of extensive area, to provide a single sheet such as that of Fig. 1. This sheet has been cut to provide triangular sections 21, 22, 23 and 24. Preferably the sheet is provided with score lines 25, 26 and 27. Where single panels are seamed together to produce such a sheet, the seams will take the place of the score lines. In any event, the score lines, or the seams, define side wall

panels 28, 29, 30 and 31. Preferably, at least four such panels are used in making the bag in accordance with the principles of the present invention, but it will be understood that this provides only a square bag. In the event a larger number of panels are to be utilized, it will then be necessary to vary the degree of the angular sections which project from each panel. That is, when a square bag of four panels is desired, the angle at the apex of each triangular section will have to be cut to 90 degrees. As a further illustration, suppose a sheet having double the number of panels or eight walls is desired, each angle of the triangular portion indicated will have to be cut at 45 degrees. In other words, the size of the angle which must appear in the triangular portions is equal to 360 degrees divided by the number of panels desired. It will also be observed, therefore, that as the number of panels is increased and the size of each angle is correspondingly decreased, an article which is cylindrical in cross section will be approached.

Referring now to Fig. 2, it will be seen that panels 31 and 30 have been superimposed on panels 28 and 29 respectively. Thereafter the ends of the panels marginally are sealed together as indicated at 32. If a thermoplastic material, such as pliofilm, is used, a coalesced or welded seam will be obtained. However, any other type of material which is heat sealing or which can be secured together by suitable adhesives can be used. This includes fibrous materials, metallic foils, fabrics and the like, depending upon the type of material it is desired to use in such articles and the purposes for which they are intended.

After the seal 32 has been effected, the bag when opened up will form a tube, as shown in Fig. 3. However, by restoring the tube to collapsed form, as indicated in Fig. 4, the same is ready for further sealing. In this position the collapsed tube is the same as that shown in Fig. 2. The outside marginal portions of the triangular sections where they are in face-to-face contact are next sealed together as indicated at 33 and 34. It should here be noted that this order of steps is essential to the manufacture of this type of bag. It will be seen that sealing adjacent portions other than the outside marginal portions of the construction at this point will make impossible the fabrication of such an article as herein contemplated.

The partially sealed tube of Fig. 4 is next opened up and the walls or panels 31 and 28 brought against the panels 30 and 29 respectively to allow of the completion of the sealing of the bottom of the bag. In other words, the marginal portions *a* and *a* of triangular sections 21 and 24 have been sealed together, as indicated at 34, and the marginal portions *a* and *a* of triangular sections 22 and 23 have been sealed together, as indicated at 34. With the opening and refolding of the partially formed bag, so that the panels 31 and 28 come in contact or overlie the panels 30 and 29, respectively, the sealing of the marginal portions *b* and *b* of triangular sections 22 and 23 will be permitted, as well as the marginal portions *b* and *b* of the triangular sections 21 and 24. The final seals are indicated at 35 and 36, respectively, in Fig. 5.

When the bag is completely opened up into squared position and viewed from the bottom, it will appear as illustrated in Fig. 6. A bag having, for example, six panels and, therefore, triangular sections of 60 degrees at each apex, will appear as illustrated in Fig. 12.

A liner or bag of the type above described, which is square in cross section and thus has a square bottom, can readily be transformed into a round flat bottom bag in which the base becomes circular, and the walls become cylindrical in cross section. This can be accomplished in several ways. For example, if at the time the triangular sections 21 to 24 are cut, there are secured curved reinforcing segments 37, 38, 39 and 40 into these triangular portions, as indicated in Fig. 7, a novel type of flat bottom bag can be provided. These segmental portions may be of any suitable stiff material, such as fiber or cardboard, and may be pasted on the inside, on the outside, or on both sides in superimposed relationship with respect to each other, with the bag material therebetween. After the liner has been fabricated as illustrated in Figs. 1 to 6, these segments 37 to 40 will form a disconnected circular element in the flat bottom of the square bag. The reason for using segments initially in the fabrication of the article is to permit the sealing of the seams in the formation of the flat bottom and to avoid overlapping of the seams if the reinforcing segments are placed on the seam side of the flat bottom.

In the modification shown in Fig. 10 an unbroken circular element or ring 41 has been secured to the flat bottom of the bag after the same has been fabricated, as illustrated in Fig. 6. Preferably, if the circular element 41 is placed on the outside, or whichever happens to be the seam side, of the liner or bag it can be gouged out, as indicated at 42 at points where the seams 33, 34, 35 and 36 are bridged thereby, as indicated in Fig. 11.

In addition to reinforcing the bottom of such a liner or bag, the primary purpose of securing these circular elements thereto is to permit the bag to be changed from a square type to a substantially circular type in cross section with a circular flat bottom base. For example, when such an article is used as a liner and is put into a barrel which is to be filled with a granular material, substantially no overlapping of the bottom and side seams will occur. The square liner is merely inserted into the bag to be filled. By pulling up the side of the bag, the bottom will conform to the circular grommet or ring, thereby changing the contour of the bag from square to circular at the bottom, as well as changing its contour around the vertical walls from flat to curved. In this way a square bottom bag which is square in cross section can readily be utilized in cylindrical containers. This solves a problem of long standing in the industry, in that square bags can now be utilized in large circular drums, whether the material to be packaged is powdered, granular, semi-solid or even liquid. Also, hermetic seals can be imparted to the seam structures where the type of liner material used is of a thermoplastic nature and which autogenously can be bonded together.

The article herein described can also be used for covering other large and small articles of manufacture where it is desired to keep the same hermetically sealed, and to protect the same against moisture and vapor. For example, all types of articles, from precision instruments to turrets on tanks, army tanks themselves, airplane engines, etc., whether they are of rectangular, square or round construction, can be covered and sealed by covering the same with articles of this general type.

It will thus be seen that the objects hereinbe-

fore set forth can readily and efficiently be attained and since certain changes in carrying out the above method and certain modifications in the article which embody the invention can be made without departing from its scope, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The method of fabricating sheet material into an article of the kind described, which comprises providing a web of said material with triangular projections along one edge thereof, folding said web upon itself and sealing the free ends thereof together marginally to form a tubular body, sealing together adjacent outside marginal portions of said triangular projections, re-forming and folding the tube to bring remaining unsealed marginal portions of said triangular projections adjacent each other and into outside position, and sealing said outside portions to provide a flat bottom for said article.

2. The method of fabricating sheet material into an article of the kind described, which comprises cutting a web of said material to provide triangular projections along one edge thereof, folding said web upon itself and sealing the free ends thereof together marginally where they are in face-to-face contact to form a tubular body, sealing together adjacent outside marginal portions of said triangular projections in face-to-face relationship, re-forming and folding the tube to bring remaining unsealed marginal portions of said triangular projections adjacent each other and into outside position, and sealing said outside portions to provide a flat bottom for said article.

3. A method of fabricating sheet material into an article of the kind described, which comprises providing a web of said material with triangular projections along one side thereof, securing to each triangular projection a curved segment of reinforcing material, folding said web upon itself and sealing the ends thereof together marginally to form a tubular body, sealing together adjacent outside marginal portions of said triangular projections, re-forming and folding the tube to bring remaining unsealed marginal portions of said triangular projections adjacent each other and into outside position, and sealing said outside portions to provide a flat bottom for said article.

4. The method of fabricating sheet material into an article of the kind described, which comprises cutting a web of said material and leaving triangular projections along one edge thereof, folding said web upon itself and sealing the free ends thereof together marginally to form a tubular body, sealing together adjacent outside marginal portions of said triangular projections, reforming and folding the tube to bring remaining unsealed marginal portions of said triangular projections adjacent each other and into outside position, sealing said outside portions to provide a flat bottom for said article, and securing a circular reinforcing element against the bottom of said article-to define a circular base when the side walls of the tube are pulled against said circular element.

EDWARD A. PARDEE.

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