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THERMOPLASTIC SEAM

Original Filed July 17, 1958

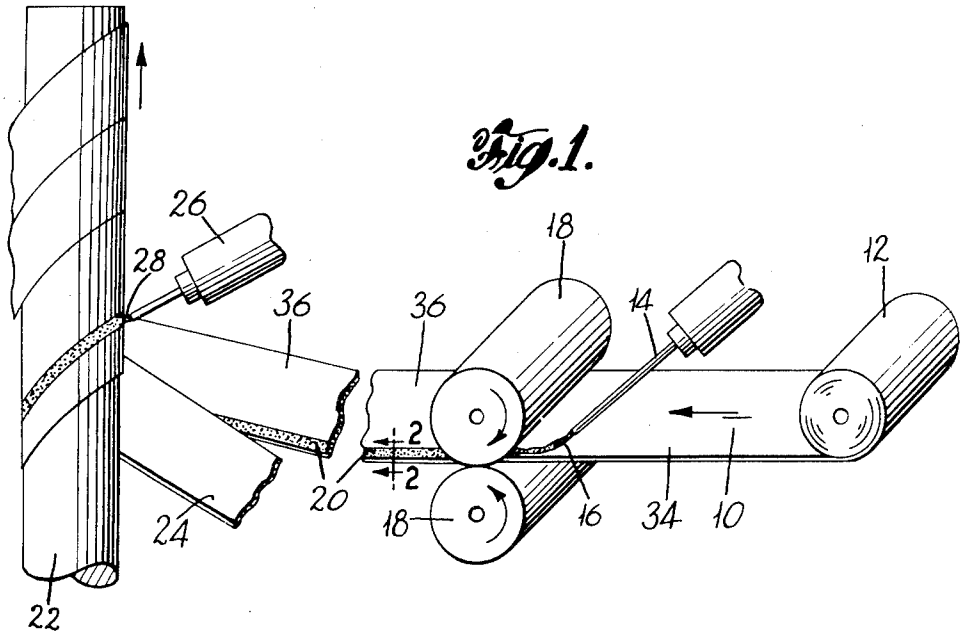


Fig. 1.

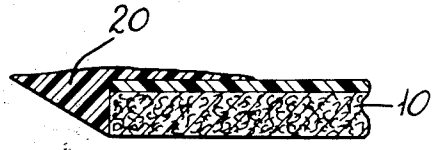


Fig. 2.

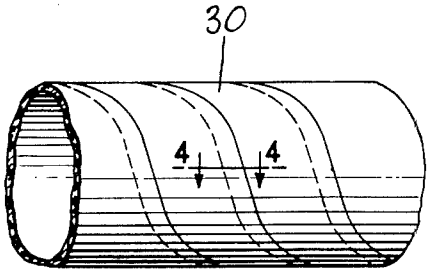


Fig. 3.

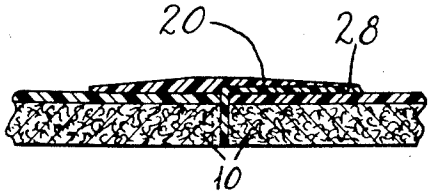


Fig. 4.

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THERMOPLASTIC SEAM

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Original application July 17, 1958, Ser. No. 749,274, now Patent No. 3,018,212, dated Jan. 23, 1962. Divided and this application Apr. 24, 1961, Ser. No. 104,927

5 Claims. (Cl. 154—43)

This invention relates to thermoplastic edged webs and thermoplastic lined containers and a method for their manufacture.

This is a divisional application of my copending application Serial No. 749,274, filed July 17, 1958, now U.S. Patent 3,018,212, issued January 23, 1962.

Continuous thermoplastic coatings over both the surface and the edges of sheet material have heretofore been generally unsatisfactory and difficult to obtain. In certain instances, as when the sheet material has been fabricated into a container, continuous thermoplastic coatings have been impossible to obtain. Coating the flat expanse of sheet material faces is easily accomplished, but the edges of the sheet material web cannot be successfully coated with thermoplastic by any of the presently known coating techniques.

The presence of a discontinuity in a coating such as is created by an uncoated and exposed sheet material edge almost completely nullifies the advantages realized from coating the sheet material faces. Uncoated sheet material edges are a point, in an otherwise completely coated container, at which leakage can develop, if the packaged contents are liquid or even semi-liquid. In addition, contamination of the contents by the elution of chemicals from the sheet material is a distinct possibility. Thus the presence of even one uncoated edge interrupts the inert, chemically resistant, moisture and vapor impermeable barrier which resin coatings, when continuous, provide.

Inaccessibility of the edges, particularly after the sheet material has been fabricated into a container, and coincidence of a sheet material edge with a container edge preclude use of spray coating techniques which are awkward, time consuming, and unreliable in these applications. Further, with thermoplastic resins, such as polyethylene, a problem of adhesion to nonmetallic substrates arises, rendering spray-coating techniques even less desirable. In other applications, such as coating of sharp-edged webs with plastic to prevent their cutting, a convenient, widely adaptable method is not known. Dip coating techniques such as are used with wax coatings are not practicable with thermoplastics.

There are two general types of bonds employed to join or seal webs of sheet material, a butt-joint or edge-to-edge bond, and a lap joint or edge margin-over-edge margin bond wherein the portion of sheet material immediately adjacent to the edge, or edge margin, is lapped over the corresponding portion of the sheet material web. In the fabrication of a paper bag, for example, a web of sheet material is folded lengthwise and the opposite edge margins are brought into contact with one another and bonded with a suitable adhesive. Thus there is a seam running the entire length of the bag. If the bag is fabricated from sheet material coated on the inner side, a continuous thermoplastic lining would be obtained if a suitable bond were made between the edges. Generally a lap joint is employed because it affords greater strength than butt joint bonds, and in many applications the extra bulk at the seam which invariably accompanies lap joints is not harmful. Whether bulky or not, the lap joint exposes an edge of the web inside the container which, if uncoated, breaks the continuity of the thermoplastic lining and defeats the purpose of the coating. Bags with discontinuous linings are prone to unsightly staining and

physical weakening due to seepage of the contents. Because a butt joint generally lacks the necessary strength for most bag making and similar applications, it is not so widely used, although with such a joint adjacent, uncoated edges are co-extensive and are thus not exposed to the container contents and a bond of less bulk is obtained.

A bag with a long seam is only one of the many types of containers in which the problem of exposed uncoated edges arises. Others are spiral wound containers and convolute containers which offer greater rigidity and strength but are subject to the same limitations as bags with regards to liquid and semi-liquid goods. Also, in these containers, the bulk of a lap joint can become a serious drawback.

It is an object, therefore, of my invention to provide a method for forming a bond between webs of sheet material which possesses the advantages but not the drawbacks of both the butt joint and the lap joint.

It is another object of my invention to provide a joint between webs of sheet material which is moisture impermeable, non-bulky, and strong.

A very particular object of my invention is to provide containers having a continuous plastic lining throughout.

These and other objects are accomplished in accordance with my invention by extruding a bead of a thermoplastic onto the edge margin of a web of sheet material and flattening the extruded bead, as by a pair of pinch rolls, so that a portion of the flattened bead adheres to the web edge margin of the sheet material and the remainder of the flattened bead extends outwardly from the web edge margin as a "skirt." Thereafter the sheet material can be fabricated into a container by placing a skirted sheet material edge adjacent to a second sheet material edge in such manner that the skirt of said skirted sheet material edge overlaps the edge margin of said second sheet material edge and placing adhesive therebetween and simultaneously pressing said skirt and said edge margin against said adhesive to form a joint therebetween.

The method of my invention utilizes one and preferably two extruders. The first extruder places a bead of resin upon a travelling web of sheet material near the edge. The bead after flattening adheres firmly to the sheet material and is sufficiently solidified to extend outwardly without outside support as a skirt. The second extruder places a bead of hot resin between said skirt and a second web edge margin and said skirt and edge margin are then pressed against the hot bead and become firmly bonded together thereby. Additionally, in those instances in which the two web edges are aligned in substantially abutting relation, some of the resin from the second extruder may be squeezed between said edges and form a bond therebetween as well. The bond, when formed, possesses the valuable attributes of both an overlap seal and a butt joint seal and also avoids the disadvantages of both. The bond possesses great strength, is uniform, does not leak, does not expose an uncoated surface, is easily applied, is not bulky, and is universally adaptable. This combination of qualities has not been attained before. The joint produced by the method of my invention is ideal in containers which are to package liquid, semi-liquid, and/or chemically active goods.

The method is extremely versatile in that the extruded bead can be any thermoplastic composition and can be applied to virtually any web of sheet material, regardless of thickness, whether single or multi-ply, e.g., paper, metal foil, coated paper, and laminates. The width and thickness of both the portion of the flattened bead adhering to the web and the portion protruding outwardly from the web, i.e., the skirt, can be exactly controlled during the process.

Additional advantages will become apparent from a consideration of the detailed description below of one

embodiment of the invention which is described in conjunction with the attached drawings in which:

FIGURE 1 is a diagrammatic isometric view of the apparatus according to and for carrying out the method of the preferred embodiment of the present invention,

FIGURE 2 is a section taken along the line 2—2 of FIGURE 1,

FIGURE 3 is a pictorial view of the preferred embodiment of a product of the method of my invention, and

FIGURE 4 is a section taken along the line 4—4 of FIGURE 3.

The method of my invention as particularly adapted to the formation of spiral wound containers is shown in FIGURE 1. From a consideration of the figure, it will be seen that sheet material **10** is withdrawn from a supply roll **12** at a constant rate along a predetermined path. An extruder, not shown, with nozzle **14** is positioned above the travelling web of sheet material **10** so as to be approximately ⅛ inch from the edge of the sheet material **10**. A bead of molten resin **16** is forced from the nozzle **14** onto the sheet material **10** which advances with the resin bead **16** through the nip of a pair of pinch rolls **18**. The pinch rolls **18** serve to flatten the resin bead **16**, causing it to adhere to the sheet material **10** and to extend outwardly from the sheet material **10** in a self-supporting manner as a skirt **20**. The relation of the skirt **20** and the sheet material **10** is best shown in FIGURE 2.

In order to form a spiral wound container such as shown in FIGURE 3, the sheet material **10** with skirt **20** is wound around fixed mandrel **22**. A paraffin-waxed paper slip sheet **24** is wound simultaneously with and slightly ahead of the sheet material **10** to ensure easy removal of the tube formed. A second extruder or sealer with nozzle **26** places adhesive bead **28** on the skirt **20** of sheet material **10**. Winding of sheet material **10** about the mandrel **22** is accomplished in a manner which places edge margin **34** adjacent to edge margin **36**. In the specific embodiment shown, the edges of the respective edge margins **34** and **36** are in abutting relation, however, it is within the scope of my invention for edge margins **34** and **36** to be in overlapping relation. In FIGURE 1, as the sheet material **10** is wound, skirt **20** is positioned in contact with slip sheet **24** against mandrel **22**. Successive turns of sheet material **10** place edge margin **36** of sheet material **10** in overlapping relation with

skirt **20**. The nozzle **26** places a bead of adhesive between skirt **20** and the next turn of sheet material **10**. The pressure induced by the winding action forces edge margin **36** against skirt **20** to form a bond such as shown in FIGURE 4. The bond hardens and the spiral wound container is cut as withdrawn from the mandrel and appears in FIGURE 3.

Various modifications such as formation of two skirts simultaneously and alternate embodiments of our invention such as bag and convolute wound container manufacture are obvious to those skilled in the art.

The scope of my invention, therefore, is not limited except as defined in the appended claims.

What is claimed is:

1. A sheet material container having a moisture proof seam comprising contoured sheet material and wherein adjacent edges of said sheet material define a seam and extending from the edge margin of the first sheet to the edge margin of the second sheet across said seam a hardened, self-supporting skirt of thermoplastic which is heat and pressure bonded to the edge margin of said first sheet and adhesive bonded to the edge margin of said second sheet.

2. The sheet material container claimed in claim 1, wherein the seam is a lap joint seam.

3. The sheet material container claimed in claim 1 wherein the seam is a butt joint seam.

4. A tubular sheet material container having a moisture proof seam comprising spiral wound sheet material and wherein adjacent edges of said wound sheet material define a seam and extending from the edge margin of one turn of the sheet material to the edge margin of the next turn of the sheet material across said seam a hardened, self-supporting skirt of thermoplastic which is heat and pressure bonded to one edge margin and adhesive bonded to the other edge margin.

5. The tubular sheet material container claimed in claim 4 wherein the entire interior surface of the container is plastic coated.

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