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PLURAL-PLY PAPER BAG FOR ARCTIC AND TROPICAL CLIMATES

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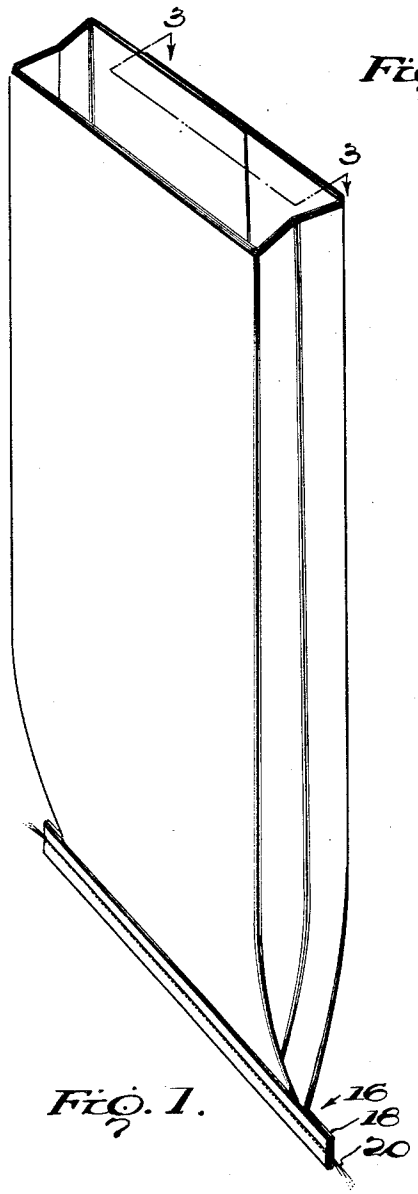


FIG. 1.

FIG. 2.

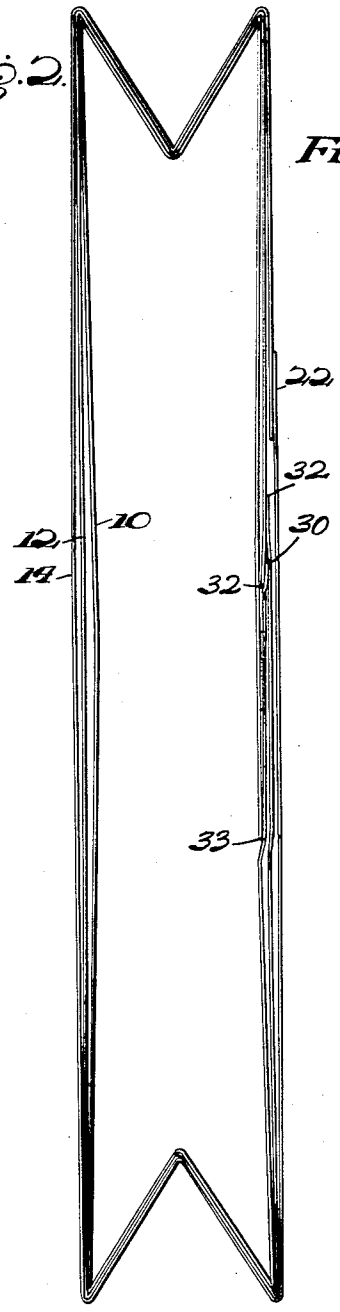
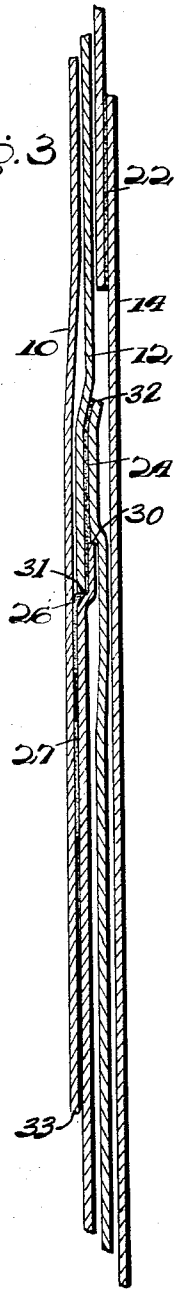


FIG. 3



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PLURAL-PLY PAPER BAG FOR ARCTIC AND TROPICAL CLIMATES

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7 Claims. (Cl. 229—55)

This invention relates to seams formed in containers, and methods of forming them. The invention is particularly useful in (but not limited to) glued seams formed in bags having plastic coated paper liners, and methods of making such seams.

In the manufacture of paper bags and other containers having glued seams, it has been difficult to form seams capable of holding together when subjected to heavy duty usage in arctic and tropical climates as well as temperature climates. Particular difficulty has been experienced in the case of seams formed in laminated or plastic coated paper, such as polyethylene coated kraft paper.

An object of this invention is to provide new and improved container seams capable of holding together over a wide range of temperatures, and methods of forming such seams.

Another object of the invention is to provide new and improved glued seams in bags having plastic coated paper liners, and methods of making such seams.

A complete understanding of the invention may be had from the following detailed description of a container seam forming a specific embodiment thereof, when studied in connection with the appended drawing, in which:

Fig. 1 is a perspective view of a multiwall paper bag having glued seams embodying the invention;

Fig. 2 is an enlarged transverse section of the multiwall bag illustrated in Fig. 1, and

Fig. 3 is a greatly enlarged section taken along line 3—3 of Fig. 1 showing the seams in detail.

The composite multiwall paper bag illustrated in the drawing is constructed from an inner liner **10** nested within an intermediate folded paper sheet **12**, which in turn is nested within an outer folded paper sheet **14**. The sheets **12** and **14** are made of ordinary kraft paper, while the inner liner **10** is made of a plastic coated paper, preferably a polyethylene coated kraft paper.

The multiwall paper bag is provided with a bottom seam **16** which may be formed in any convenient manner. For example, the bottom ends of the liner **10** and the sheets **12** and **14** may be glued together by means of suitable adhesives. As shown in Fig. 1, a reinforcing strip **18** of paper may be folded around these ends and stitched to them by means of a length of strong thread **20**.

The outer paper sheet **14** is folded into tubular form and provided with a longitudinal side seam by overlapping its opposite edges **28**, **29** and gluing them together with a single glue line or adhesive stripe **22** interposed therebetween. Similarly, a single glue line or adhesive stripe **24** is applied inside the overlapped opposite edges **31**, **32** of the intermediate sheet **12**. Since the sheets **12** and **14** are made of ordinary uncoated and unlaminated kraft paper, sufficient bonding strength over the desired temperature range can be obtained by the use of suitable well known adhesives. For example, adhesives compounded from dextrin and starch, or polyvinyl alcohol borax have demonstrated their suitability. However, when these adhesives alone are applied to laminated or plastic coated kraft paper they fail to perform over the specified temperature range, and particular difficulty with seam failures is encountered at arctic temperatures.

In accordance with the present invention the inner liner **10**, which has been previously described as being composed of a plastic coated paper and preferably a polyethylene coated kraft paper, is provided with a longitudinal side seam having good adhesive strength over the temperature range −70° F. to +140° F. This objective is achieved by employing two different adhesives applied in two parallel lines or stripes **26** and **27** inside the overlapped opposite edges of the liner **10**. Both adhesives are capable of bonding strongly to plastic coated kraft paper under ordinary moderate conditions of temperature and usage, but one of these adhesives is compounded specially to provide good adhesive strength under heavy duty usage over a wide temperature range including extreme arctic and tropical temperatures.

The glue line **26** is designated the primary glue line, and it contains the specially compounded adhesive. This adhesive is composed essentially of an adhesive silicon resin mixed with a rubbery elastomer. It cures or sets slowly to form an adhesive bond functional at extreme temperatures. A highly effective composition was compounded successfully from about 50% by weight of a pressure sensitive silicone adhesive containing 40% solids in a xylene solvent, and about 50% by weight of Buna S (G.R.S.) butadiene-styrene copolymer resin containing 40% solids in a suitable solvent, such as toluene, benzene or xylene. Commercially available silicone adhesives sold by Dow-Corning Corp. under the designation C–269 and C–271 are suitable for the practice of the invention; they are characterized by the following physical properties (40% solution in xylene):

Viscosity at 25° C.	cp	1000–3000
Flash point	° F	60–75
Specific gravity		.94

These adhesives are described in Dow Corning Corporation's Silicone Notes, Reference No. 4–602, dated February 1953, entitled "Properties and Applications of Dow Corning C–269 and C–271." However, it will be understood that other curable organosilicon polymers (silicones) in organic solvents, which are available on the commercial chemical market, may be likewise used, provided they have the property of curing to a cold- and heat-resistant adhesive film; for a basic discussion of the chemistry and properties of polymeric curable organosilicon compounds see, e.g. U.S. Patents Nos. 2,386,467 and 2,438,478, Hyde; assignor to Corning Glass Works. Other elastomers could be substituted for the Buna S (G.R.S.) in this composition. For example, Hycar smoked sheets, or neoprene could be used successfully. However, since the Buna S (G.R.S) is one of the least expensive and most readily available elastomers suitable for the purposes of the invention, it is preferred. It is usually desirable to work such elastomers as Buna S (G.R.S.) sheet stock on a roll mill to effect depolymerization, thus greatly increasing the solution rate in hydrocarbons and lowering the solution viscosity at a given solids content.

The glue line **27** is designated the secondary line. It comprises a commercial adhesive which sets rapidly and bonds readily to polyethylene and other plastic coated papers under ordinary temperature conditions. Good results have been obtained from the Naugatuck Chemical Co. adhesive product "Naugatuck 1789," and the National Adhesives Co. product "Polylok." In general these products are water dispersions of natural or reclaimed rubber tackified with resins and plasticizers. In the usual manner, the adhesives forming the secondary glue line may be applied to the paper bags by means of an ordinary paste wheel.

The adhesive composition comprising the primary glue line is so viscous that it may be necessary to employ a paste pump to apply the composition to the paper bags. For this purpose, a commercial gear pump powered by a quarter horsepower motor through a variable speed torque converter delivers a uniform stream of adhesive for the primary bag seam. It is desirable for this composition to have a minimum viscosity of about 20,000 centipoises to minimize "strike in."

Due to the slow rate at which the adhesive in the primary glue line sets or cures, the primary glue line must be aged for at least fifteen days at room temperature before it sets sufficiently to form an effective adhesive bond. The principal purpose of the fast setting secondary glue line is to provide a temporary adhesive bond during the time required for the primary glue line to set, thereby avoiding interference with the manufacture and the shipment of the bags.

In the manufacture of multiwall paper bags, the inner liner and the outer sheets are folded into tubular form with their opposite edges overlapping. Depending upon the size of the bag being manufactured, the opposite edges **28**, **29** and **31**, **32** of the paper sheets overlap to an extent which may vary in width from about ¾ inch up to about 2 inches. The edges **30**, **33** of the inner liner **10** may overlap somewhat more, and the two parallel glue lines **26** and **27** applied thereto should preferably be spaced apart about ¼ inch.

In the formation of the glue lines, the amount of adhesive applied should be limited to the minimum quantity required to obtain a strong bond. It was observed that the primary and secondary glue lines formed in accordance with this method formed continuous films on the paper. In each case the glue line should be applied to the flap which is inside the overlapped portions of the edges of the sheets. One edge **30** of the liner **10** may be interposed between the overlapped opposite edges **31**, **32** of the intermediate sheet **12**, as is best shown in Fig. 3. The primary glue line **26** is located nearer to the outside edge **30** of the overlapped edges **30**, **33** of the liner **10**, while the secondary glue line **27** is positioned nearer the inside edge **33** thereof. The reason for this arrangement is to facilitate the evaporation of the solvent from the adhesive in the primary glue line, thereby shortening the setting time required.

Bags having seams embodying the invention were tested by subjecting them to a standard drop test at the extreme limits of the temperature range —70° F. to +140° F. They were filled with approximately 85 pounds of navy beans; some bags were stored for a number of hours at elevated temperatures, and others at very low temperatures before being dropped. None of the bags tested failed at their seams, and the only failures observed occurred in the paper fibers.

Although the invention has been illustrated and described in connection with tubular multi-ply paper bags, it should be understood that the invention may also be embodied in parallel seam structures for other types of containers, such as single-ply bags (of coated or uncoated material), envelopes, pasteboard boxes, and the like. Furthermore, the shape, size and purpose of such containers are unrelated to the invention. Numerous changes and modifications may be made to suit special requirements without departing from the spirit and the scope of the invention.

What I claim is:

1. A plural-ply paper bag for shipment to an arctic or tropical climate, said paper bag having a tubular inner liner made from a sheet of plastics-coated paper, and at least one tubular paper ply surrounding said inner liner; said inner liner being formed by overlapping the edges of said liner, the overlapped edges of said liner being secured together by two parallel glue lines interposed therebetween and parallel thereto, one of said glue lines being composed of an adhesive compounded from an adhesive silicone resin and a rubbery elastomer, said adhesive having the characteristic of requiring several days at room temperature to set and form a strong adhesive bond effective over a temperature range of from —70° F. to +140° F., and the other glue line being composed of an adhesive compound which sets rapidly and forms a strong adhesive bond effective at ambient temperatures; whereby said paper bag may be shipped in the temperate zone upon the quick setting of said second-named adhesive, and whereby said first-named adhesive is permitted to set slowly and form a permanent glue line.

2. A plural-ply paper bag according to claim 1, wherein said rubbery elastomer is a butadiene styrene resin.

3. A plural-ply paper bag according to claim 2, wherein said first-named adhesive is compounded from about equal portions by weight of said adhesive silicone resin and of said butadiene styrene resin.

4. A plural-ply paper bag according to claim 1, wherein the outside edge of the overlap of said inner liner is adhesively secured to said surrounding paper ply, and wherein said second-named adhesive is applied proximate the other edge of said overlap and said first-named adhesive is applied intermediate said edges of said overlap, whereby the setting of said first-named adhesive is facilitated.

5. A plural-ply paper bag according to claim 1, wherein said first-named adhesive has a viscosity of at least about 20,000 centipoises prior to setting.

6. A plural-ply paper bag for shipment to an arctic or tropical climate, said paper bag having a tubular inner liner made from a sheet of plastics-coated paper, and at least one tubular paper ply surrounding said inner liner; said inner liner being formed by overlapping the edges of said liner, the outside edge of the overlap of said inner liner being adhesively secured to said surrounding paper ply, and the overlapped edges of said liner being secured together by two parallel glue lines interposed therebetween and parallel thereto, one of said glue lines being composed of an adhesive compounded from about equal parts by weight of an adhesive silicone resin and a butadiene styrene resin, said adhesive having the characteristic of requiring several days at room temperature to set and form a strong adhesive bond effective over a temperature range of from —70° F. to +140° F., and the other glue line being composed of an adhesive compound which sets rapidly and forms a strong adhesive bond effective at ambient temperatures; said second-named adhesive being applied proximate the free edge of said overlap, and said first-named adhesive being applied intermediate the glue line formed by said second-named adhesive and the outside edge of the overlap which is adhesively secured to said surrounding paper ply so as to facilitate the setting of said first-named adhesive; whereby said paper bag may be shipped in the temperate zone upon the quick setting of said second-named adhesive, and whereby said first-named adhesive is permitted to set slowly and form a permanent glue line.

7. A plural-ply paper bag, according to claim 6, wherein said first-named adhesive has a viscosity of at least about 20,000 centipoises prior to setting.

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