Jan. 15, 1935. W. R. COLLINGS ET AL 1,988,265

CONTAINER

Filed July 30, 1931 2 Sheets-Sheet 1

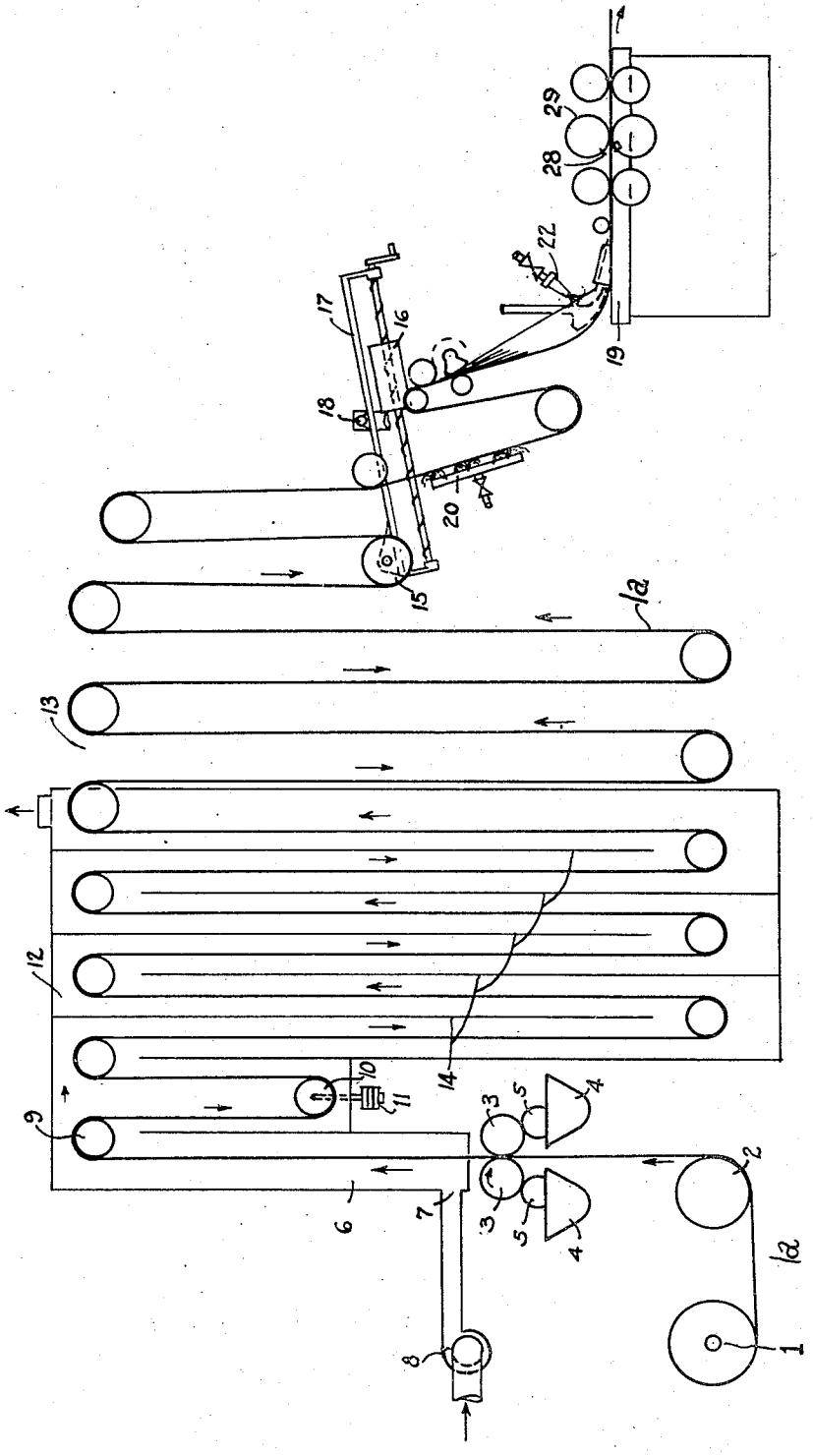


Fig. 1

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Filed July 30, 1931 2 Sheets-Sheet 2

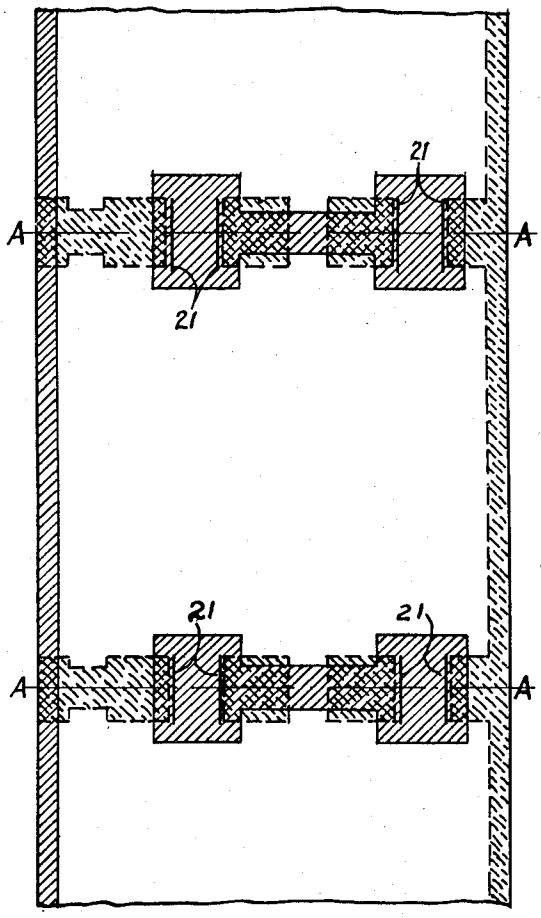


Fig. 2

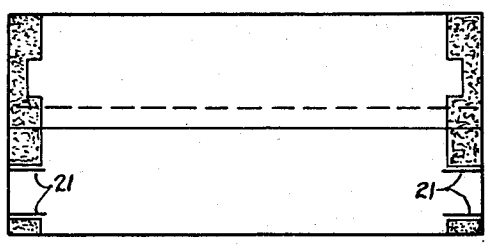


Fig. 3

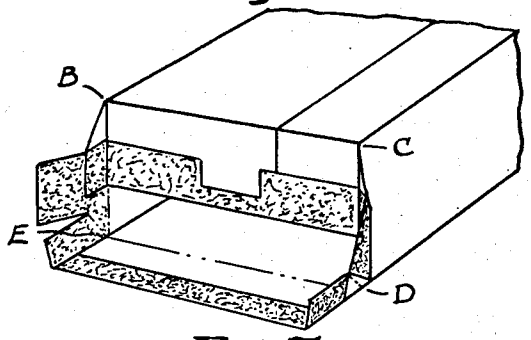


Fig. 5

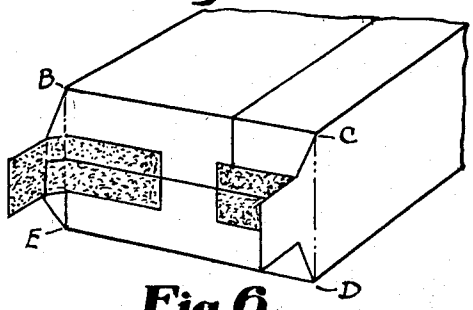


Fig. 6

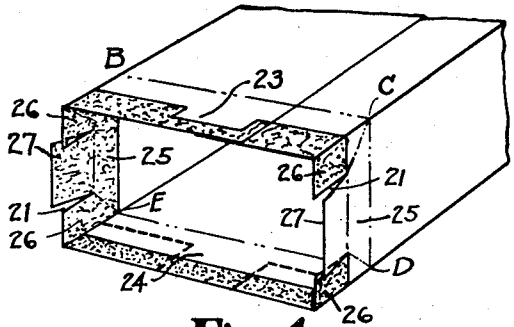


Fig. 4

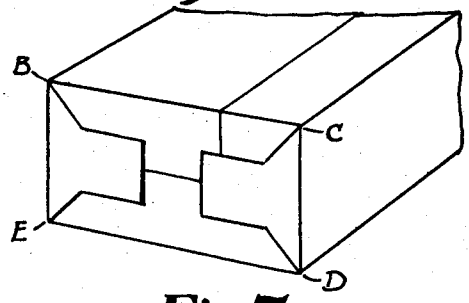


Fig. 7

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UNITED STATES PATENT OFFICE

1,988,265

CONTAINER

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Application July 30, 1931, Serial No. 553,962

13 Claims. (Cl. 93—35)

The present invention relates to adhesively sealed containers, particularly paper bags, and has especial reference to methods for forming and sealing paper bags made of a compressible paper stock, such as corrugated, crinkled or creped paper, or of a multi-ply composite paper comprised of plies of such compressible paper.

The type of bag with which the invention is particularly concerned is one such as is commonly employed for packaging heavy granular or pulverized materials in units of considerable weight, say, of 50 to 100 pounds or more, which materials must be protected more or less completely from contact with the air. Examples of such materials are calcium chloride, magnesium chloride, Portland cement, hydrated lime, prepared plaster, etc. The packages should be practically impervious to air and in many cases moisture-proof. A further requirement of practical importance is that the package be adapted for filling and sealing in a continuous manner in automatic packaging machines, for which purpose it is essential that the package may be tightly sealed with adhesive and almost immediately removed by mechanical means without loosening or breaking the freshly sealed joints.

It is one of the objects of the invention, therefore, to provide a paper bag, or a blank or tube therefor, particularly one made of rough or irregularly surfaced paper stock, which is capable of being sealed quickly and expeditiously, as in an automatic packaging machine, to form a fast, leak-proof and substantially air-tight closure. The invention, then, consists of the improved paper bag container, together with the method of forming and sealing the same, hereinafter fully described and particularly pointed out in the claims. In the annexed drawings and following description are set forth in detail one method and associated means for producing an improved paper bag in accordance with the principle of our invention, such detailed description illustrating, however, but one of the various ways in which the principle of the invention may be used.

In said annexed drawings:—

Fig. 1 represents diagrammatically an arrangement of apparatus suitable for forming a bag tube according to the invention. Fig. 2 shows the location of slits and the glue application pattern on the paper sheet from which one form of bag specifically described herein is made up. Fig. 3 shows a flat or collapsed bag tube. Figs. 4–7 illustrate the manner of folding and sealing an end of the bag.

We have found that paper bags for packaging heavy granular or pulverized materials in units weighing as much as 50 to 100 pounds should be made not only from a strong paper stock, but also from one which possesses some elasticity or resiliency so that the filled package is better enabled to withstand repeated handling with a minimum of tearing or breaking. For this purpose a crinkled or corrugated paper stock, or a composite sheet comprised of two or more plies of such paper fastened together by adhesive, is best adapted. When a composite sheet is used, it may be further reinforced with a fabric, such as burlap, or by strands of yarn interlaid between the plies. Such forms of paper stock ordinarily have a more or less rough or uneven surface. When two such surfaces are to be sealed together with adhesive, as in making a bag tube or in closing the bag ends, it is difficult to make a well bonded joint or seam. When applied in liquid form at the time such joint or seam is closed and sealed, the adhesive cannot flow readily into and penetrate the hollows and recesses of the paper surface unless at a consistency too thin or fluid to set satisfactorily. For similar reasons it has also been found in our experience that bags made of such rough surfaced paper and previously coated with adhesive on only one of the two surfaces to be sealed together cannot be reliably sealed when handled on ordinary automatic packaging and sealing machines because the adhesive-coated surface does not make a good bond with the paper surface and the joint is liable to come apart again before the adhesive sets.

In order to overcome the difficulties just referred to, we have devised an improved method of sealing bags of the character in hand whereby a layer or coat of adhesive, such as animal, vegetable or fish glue or the equivalent, is applied to both of the surfaces later to be sealed together, such adhesive being dried in place during manufacture of the bag and then remoistened just previous to sealing. In this way the adhesive may be applied over the desired area in the usual way at such consistency as to penetrate and to coat the surface completely and homogeneously. The adhesive is then dried in transit of the bag through the manufacturing process. By remoistening and bringing together two such adhesively-coated surfaces the bond is formed from adhesive to adhesive, instead of from adhesive to paper. Less moistening is necessary and a tight seal is formed uniformly over

the entire adhesive surface which sets immediately so that it cannot be broken loose.

If it is desired to make the sealed joint resistant to moisture, this may be accomplished, when using animal glue as the adhesive, by remoistening the glue-coated surface with a solution of a substance capable of coagulating and hardening the glue, so that the glue sets in a form which is not thereafter softened by contact with water. Substances of the class described include aluminum salts, chromium salts, formaldehyde, etc.

To make a bag capable of being sealed so as to be substantially leak-proof and air-tight, we have found that all surfaces which are overlapped in closing the bag should be completely double-sealed with adhesive in the manner just described, otherwise cracks or openings will be left between the paper folds through which sifting and leakage may occur or air or moisture may enter. This precaution has not hitherto been observed, so far as we are aware, in sealing paper bags, due in part, no doubt to the practical difficulty of so sealing a bag by any of the usual hand or machine-operated methods. We have now made it possible to double-seal completely all over-lapping surfaces in a folded closure of a paper bag by preparing a bag tube from a running roll of suitable paper stock which is coated on either face with glue or other adhesive in a pattern to correspond with the surfaces which are lapped when the bag is folded and sealed in forming the tube and in closing the ends. The glue-coated surfaces are first dried to fix the glue on the paper, and then remoistened just prior to sealing the same together.

So that the method of forming a bag tube according to our invenion may be more clearly understood, reference is made to the drawings. In Fig. 1 a roll 1 of suitable paper stock feeds a continuously moving web or sheet 1*a* which passes around a guide roll 2 and thence between two glue applicator rolls 3. The latter are provided with raised or embossed figures on the face thereof corresponding to the glue pattern to be formed on the sheet. One form of glue pattern is shown in Fig. 2 in which the cross-hatched areas bounded by solid lines represent the glue-coated portions of the surface of one side of the sheet which are to be on the inside of the finished tube, while the broken cross-hatched areas bounded by dotted lines indicate similar portions on the reverse side of the sheet which are to be on the outside of the tube. The double cross-hatched areas indicate those in which both sides of the paper are glue-coated. A continuous glued margin is provided along one edge of one side of the sheet and along the opposite edge of the reverse side of the sheet. The rectangular areas shown on each side are applied at regular intervals spaced to correspond to the length of the finished bag tube. The broken line AA indicates the dividing line along which the continuous tube is later cut to form the individual bag tubes.

Liquid glue is supplied to the glue printing figures on the face of the applicator rolls 3 from trough or pans 4 by means of feed rolls 5. As the sheet passes between the rolls 3 the glue pattern is printed on both sides thereof. From the printing rolls the sheet passes at once into a chamber 6 wherein it is subjected to the drying action of a current of warm air introduced at inlet 7 by means of blower 8 at a temperature preferably not exceeding about 140° F. The sheet then passes over a guide roll 9 and thence to a tension roll 10 also enclosed in a chamber supplied with warm air from chamber 6. The weight of roll 10 is supported by the traveling sheet to maintain a suitable tension thereon which is adjustable by means of weights 11. From the tension roll the sheet passes to a festoon dryer of usual design. Such dryer consists of two sections, one being enclosed and forming a warm air dryer 12, while the other is open to the air and forms an air cooler 13. Dryer section 12 communicates with chamber 6 and is supplied with a current of warm air from the latter. Baffles 14 are provided to conduct the warm air stream in parallel direction with the travel of the paper sheet in dryer 12. In passage through chamber 6 and dryer 12 the glue is dried and set on the sheet. The sheet then travels through several passes in air cooler 13 to cool the same and further harden the glue. The cooled sheet then passes under a second tension roll 15 the pressure of which is adjustable by means of a movable weight 16 on a lever 17 pivoted at 18. Tension roll 15 effects a final adjustment of tension on the traveling sheet to balance or compensate for the stretch of the latter, the amount of which varies with changes in the quality of the paper, atmospheric conditions, etc.

From the tension roll 15 the sheet passes over suitable guide rolls to a tubing machine 19 of standard design, in which the flat sheet is folded over on itself to bring together the glued margins at the edges thereof in overlapping relation and seal the same together into a continuous tube from which the blanks are successively cut off. Just prior, however, to entering the tubing machine the glued margins along the edges of the sheet are softened by exposing them to a steam jet from a nozzle or perforated pipe 20. During the tubing operation longitudinal slits 21 are cut in the sheet at regular intervals so as to register with the glue pattern as shown in Fig. 2. Before sealing the seam of the tube the glued margins of the sheet, which have already been softened by steam as aforesaid, are superficially moistened by a fine spray of water from a nozzle 22. Thereby the glue is rendered superficially gummy, tacky, or viscid without weakening its adhesion to the paper underneath, so that when the two glued margins are brought together and pressure applied they will at once become firmly and uniformly cemented to each other to form a tight seam which will not thereafter loosen and come apart. If it is desired to produce a water resistant seam, the moistening of the glued margins may be accomplished with a solution of a glue hardening agent, as referred to hereinbefore. In cutting off the bag blanks from the continuous tube the cutting-off knife 28, shown as carried by roll 29, is timed to sever the tube on a line through the center of the glue pattern corresponding to line AA of Fig. 2.

A flat or collapsed bag blank as thus formed is shown in Fig. 3, the glued areas at either end on one side being indicated by the shaded portions. In order to fold and seal the bottom end of the bag, the blank is first opened up or expanded, as shown in Fig. 4. The expanded blank is then most conveniently slipped over a rectangular forming block conforming in shape and dimensions to the finished bag, so that the end of the block just comes as far as the dot-dash line

BCDE, which indicates the shoulder line at which the sides are to be inwardly folded. The overhanging open end of the blank then provides two base flaps, consisting of a top flap 23 and a bottom flap 24, and two lateral flaps 25, each consisting of two wing portions 26 and a central tab 27 formed therein by the slits 21. The slits are cut to a depth which is short of the shoulder lines BE and CD. In accordance with the glue pattern, the inner surface of the lateral flaps 25, including both wings 26 and tabs 27, is entirely coated with glue back to the shoulder lines BE and CD; the outer surface of wings 26, but not of tabs 27, s coated to the depth of slits 21, as shown by the shaded areas; the outer surface only of top flap 23 is coated with a glued margin along the edge which is widened at either end to the same width as on wings 26, as shown; the inner surface of bottom flap 24 is coated along the margin as shown in shaded area and the outer surface thereof is coated in a rectangular area at either end to the same width as wings 26, as shown in dotted outline.

To close the end, after the glued areas are moistened, tabs 27 are first bent back slightly, as shown in Fig. 4; top flap 23 is folded down along shoulder line BC, as shown in Fig. 5; bottom flap 24 is folded up along line ED to overlap the top flap 23, as shown in Fig. 6; and finally the lateral flaps 25 are folded over along lines BE and CD, as shown in Fig. 7. When top flap 23 is folded down, it causes the upper corner of each lateral flap to be simultaneously folded down upon itself on a diagonal line from corner B or C to the bottom of slit 21, thus bringing the glued inner surfaces together at the corner and making the glued wing portions 26 at either side a prolongation of top flap 23 which is lapped against the glued inner face of flap 25 and sealed thereto. The lower corners are similarly lapped when bottom flap 24 is folded up and sealed. In this manner the junction between the top or bottom flaps and the lateral flaps is completely sealed together, leaving no gap or crack through which sifting of the contents of the filled bag can occur. The glued inner surface of bottom flap 24, when folded over in the manner shown, matches the glued margin of the outer surface of top flap 23, thus bringing two glued surfaces together. The wider extensions of glued surface at either end of top flap 23 are left uncovered when bottom flap 24 is folded over, but these extensions are thereby joined with the glued areas on the outer surface of bottom flap 24 to form a rectangular area corresponding to the glued inner surface of lateral flaps 25, so that when the latter are folded down the two glued surfaces are brought together. The glued areas are superficially moistened just prior to sealing either with water or a solution of a glue hardening agent, employing a brush, spray or other suitable means for applying the same. After the bottom-sealed bag is filled with the material to be contained therein, the top may be folded and sealed in analogous manner, the contents of the bag being used in place of a forming block against which the flaps are folded and pressed together.

The form of closure described, employing a blank the ends of which are precoated with glue according to a predetermined pattern, is characterized by the feature that all meeting surfaces brought together in sealing the ends are glue-coated. Thereby the seal is made between two glued surfaces in every case, and not from glue to paper. All meeting surfaces are firmly glued together by remoistening and application of slight pressure in such way that the joint sets almost instantaneously and so tightly that it cannot again be pulled apart.

This type of bag closure will withstand without rupture any sort of handling which the paper fabric itself will resist. It is double-sealed in every fold against leakage, so as to be substantially air-tight. It is particularly well adapted for use with automatic bag filling and sealing machines, enabling the tight sealing of bags made of any type of paper at a rapid rate without difficulty caused by failure of the sealed joints to hold fast. In our experience the method of double sealing herein described is absolutely essential to the success of automatic filling and sealing of bags made of rough surfaced or crinkled paper such as are commonly used for packaging heavy granular or pulverized materials.

When the bag is intended for packaging hygroscopic materials, such as calcium chloride, we prefer to employ a water-proof composite paper sheet from which to fabricate the bag blank. A preferred form of composite sheet of this type consists of two plies of creped paper adhesively sealed together by asphalt or pitch, and preferably reinforced by a textile fabric or by strands of yarn interlaid between the plies. Such type of bag is preferably to be sealed with animal glue which is remoistened by a water solution of a glue hardening agent, to make the joints substantially moisture proof.

Obviously other types of adhesively sealed bag closures than that specifically described, such as are well known in the art, may be used without departing from the principle of the invention, provided that a corresponding adhesive pattern be affixed to the bag blank and dried during manufacture to coat all areas which constitute meeting surfaces when the closure is effected, and that the sealing be accomplished by remoistening the adhesive, bringing the corresponding adhesively-coated surfaces into reciprocal relation with each other and pressing them together. Examples of such other forms of paper bag closures are shown, for instance, in United States Patents 519,398 and 1,633,296, each of which may be adapted for use in connection with our invention by proceeding in general according to the principle of our invention as hereinbefore described.

This application is a continuation in part of our prior application Serial No. 365,044, filed May 22, 1929.

Other modes of applying the principle of our invention may be employed instead of the one explained, change being made as regards the method herein disclosed, provided the step or steps stated by any of the following claims or the equivalent of such stated step or steps be employed.

We therefore particularly point out and distinctly claim as our invention:—

1. In a method of making a paper bag, the steps which consist in applying adhesive to a continuous running sheet of paper in a pattern corresponding to the meeting surfaces to be sealed together in forming and closing such bag, drying the adhesive, forming the sheet into a tube to bring the adhesively-coated margins of the sheet into overlapping relation, sealing the seam by remoistening and pressing together the so

overlapped adhesively-coated margins and severing the individual blanks from the continuous tube.

2. In a method of making a paper bag, the steps which consist in applying glue to a continuous running sheet of creped or other rough surfaced paper in a pattern corresponding to the meeting surfaces to be sealed together in forming and closing such bag, drying the glue, forming the sheet into a tube to bring the adhesively-coated margins of the sheet into overlapping relation, sealing the seam by remoistening and pressing together the so overlapped glue-coated margins and severing the individual blanks from the continuous tube.

3. In a method of making a paper bag, the steps which consist in applying animal glue to a continuous running sheet of water-proof composite paper consisting of two plies of creped paper cemented together by asphalt and reinforced by fibrous material interlaid between the plies, the glue being applied in a pattern corresponding to the meeting surfaces to be sealed together in forming and closing such bag, drying the glue, forming the sheet into a tube to bring the glue-coated margins of the sheet into overlapping relation, sealing the seam by remoistening with an aqueous solution of a glue-hardening agent and pressing together the so overlapped glue-coated margins and severing the individual blanks from the continuous tube.

4. The method of making a paper bag which comprises applying adhesive to a continuous running sheet of paper in a pattern corresponding to the meeting surfaces to be sealed together in forming and closing such bag, drying the adhesive, forming the sheet into a tube to bring the adhesively-coated margins of the sheet into overlapping relation, sealing the seam by remoistening and pressing together the so overlapped adhesively-coated margins, severing the individual blanks from the continuous tube, forming the bottom by remoistening the adhesively-coated areas at one end of such blank, folding the sides inwardly upon each other so as to bring corresponding adhesively-coated areas into reciprocal relation with each other and sealing the same together.

5. The method of making a paper bag which comprises applying glue to a continuous running sheet of creped or other rough surfaced paper in a pattern corresponding to the meeting surfaces to be sealed together in forming and closing such bag, drying the glue, forming the sheet into a tube to bring the glue-coated margins of the sheet into overlapping relation, sealing the seam by remoistening and pressing together the so overlapped glue-coated margins, severing the individual blanks from the continuous tube, forming the bottom by remoistening the glue-coated areas at one end of such blank, folding the sides inwardly upon each other so as to bring corresponding glue-coated areas into reciprocal relation with each other and sealing the same together.

6. The method of making a paper bag which comprises applying animal glue to a continuous running sheet of water-proof composite paper consisting of two plies of creped paper cemented together by asphalt and reinforced by fibrous material interlaid between the plies, the glue being applied in a pattern corresponding to the meeting surfaces to be sealed together in forming and closing such bag, drying the glue, forming the sheet into a tube to bring the glue-coated margins of the sheet into overlapping relation, sealing the seam by remoistening with an aqueous solution of a glue-hardening agent and pressing together the overlapped glue-coated margins of the paper sheet, severing the individual blanks from the continuous tube, forming the bottom by remoistening the glue-coated areas at one end of such blank with an aqueous solution of a glue-hardening agent, folding the sides inwardly upon each other so as to bring corresponding glue-coated areas into reciprocal relation with each other and sealing the same together.

7. A blank for a paper bag suitable for packaging heavy materials and for filling and sealing in an automatic packaging machine, said blank comprising a tubular member of creped or similar elastic paper having adhesively-coated areas in predetermined pattern on the sides thereof at either end, such pattern coinciding in shape and extent substantially with all the meeting surfaces which are to be brought together in folding over and sealing the ends of the bag.

8. A blank for a paper bag suitable for packaging heavy materials and for filling and sealing in an automatic packaging machine, said blank comprising a tubular member of composite waterproof paper consisting of two plies of creped paper cemented together by asphalt and reinforced by fibrous material interlaid between the plies, such tubular member having on the sides thereof at either end glue-coated areas in predetermined pattern coinciding in shape and extent substantially with all the meeting surfaces which are to be brought together in folding over and sealing the ends of the bag.

9. A paper bag suitable for packaging heavy materials and for filling and sealing in an automatic packaging machine, said bag comprising a tubular body portion formed of creped or similar elastic paper, a bottom formed of the inwardly folded and overlapped sides of the body portion double-sealed at all joints and seams thereof with a layer of adhesive cemented to each face of the overlapping paper surfaces over substantially the entire area of contact therebetween, and adhesively-coated areas in predetermined pattern on the sides of the body adjacent to the open end thereof, such pattern coinciding in shape and extent substantially with the meeting surfaces which are to be brought together in folding over and sealing the end of the bag after filling the same.

10. A paper bag suitable for packaging heavy materials and for filling and sealing in an automatic packaging machine, said bag comprising a tubular body portion formed of composite waterproof paper consisting of two plies of creped paper cemented together by asphalt and reinforced by fibrous material interlaid between the plies, a bottom formed of the inwardly folded and overlapped sides of the body portion double-sealed at all joints and seams thereof with a layer of glue cemented to each face of the overlapping paper surfaces over substantially the entire area of contact therebetween, and glue-coated areas on the sides of the body portion adjacent to the open end in predetermined pattern coinciding in shape and extent substantially with the meeting surfaces which are to be brought together in folding over and sealing the end of the bag after filling the same.

11. In a method of making a paper bag, the steps which consist in applying a liquid adhesive to a sheet of creped or similar elastic

paper in a pattern corresponding to the meeting surfaces to be subsequently sealed together in forming and closing the bag, drying the adhesive, forming the sheet into a bag by folding the sheet so as to bring the adhesively-coated surfaces into reciprocal relation to each other, softening the adhesive and sealing the meeting surfaces together.

12. In a method of making a paper bag, the steps which consist in applying a liquid glue to a sheet of creped or similar elastic paper in a pattern corresponding to the meeting surfaces to be subsequently sealed together in forming and closing the bag, drying the glue, forming the sheet into a bag by folding the sheet so as to bring the glue-coated surfaces into reciprocal relation to each other, softening the glue and sealing the meeting surfaces together.

13. In a method of making a paper bag, the steps which consist in applying a liquid glue to a sheet of creped or similar elastic paper in a pattern corresponding to the meeting surfaces to be subsequently sealed together in forming and closing the bag, drying the glue, forming the sheet into a bag by folding the sheet so as to bring the glue-coated surfaces into reciprocal relation to each other, softening the glue and remoistening the same with a solution of a glue-hardening agent, and sealing the meeting surfaces together.

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