Jan. 25, 1944. K. R. KARLSON 2,340,127

PROCESS OF SLITTING AND COATING

Filed May 26, 1941 2 Sheets-Sheet 1

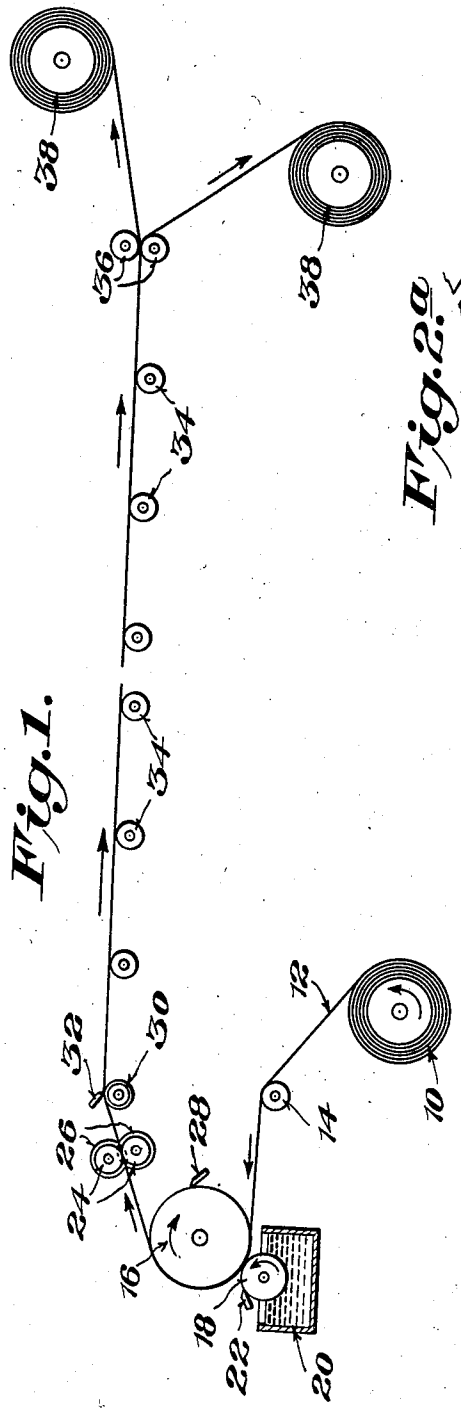


Fig. 1.

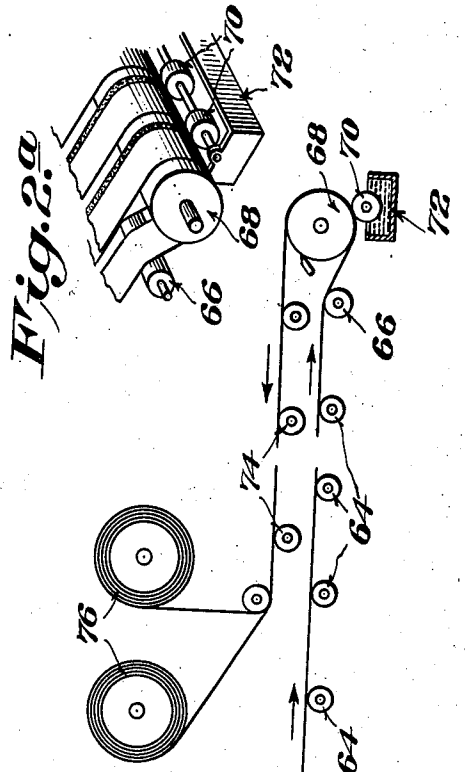


Fig. 2a.

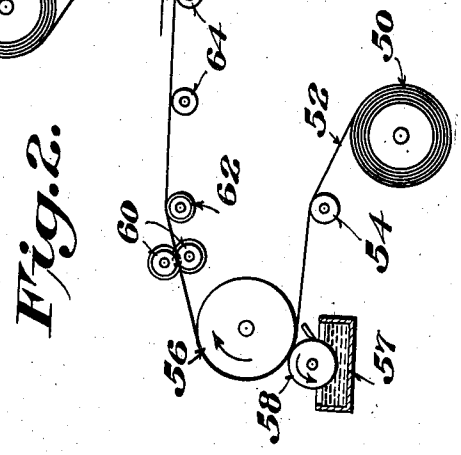


Fig. 2.

Inventor
Karl R. Karlson,
By Ross Attorney
Attorney

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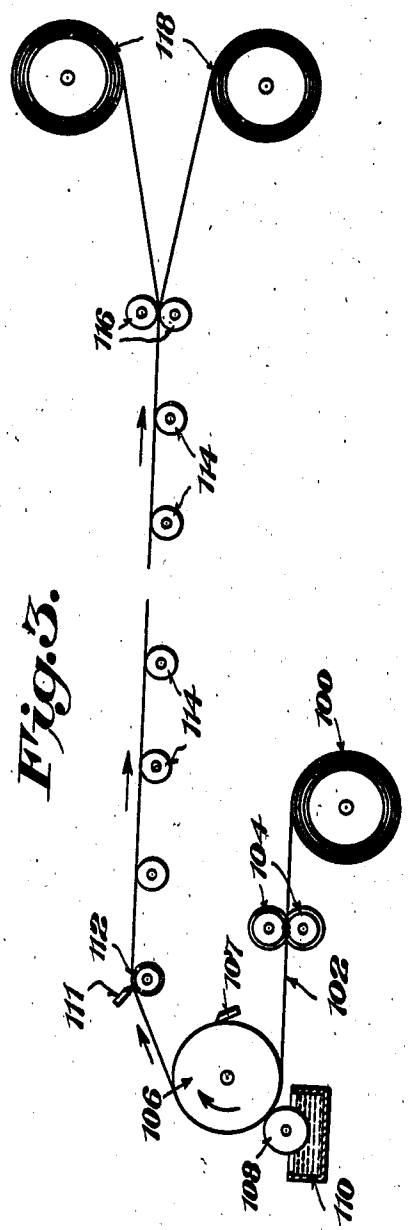


Fig. 3.

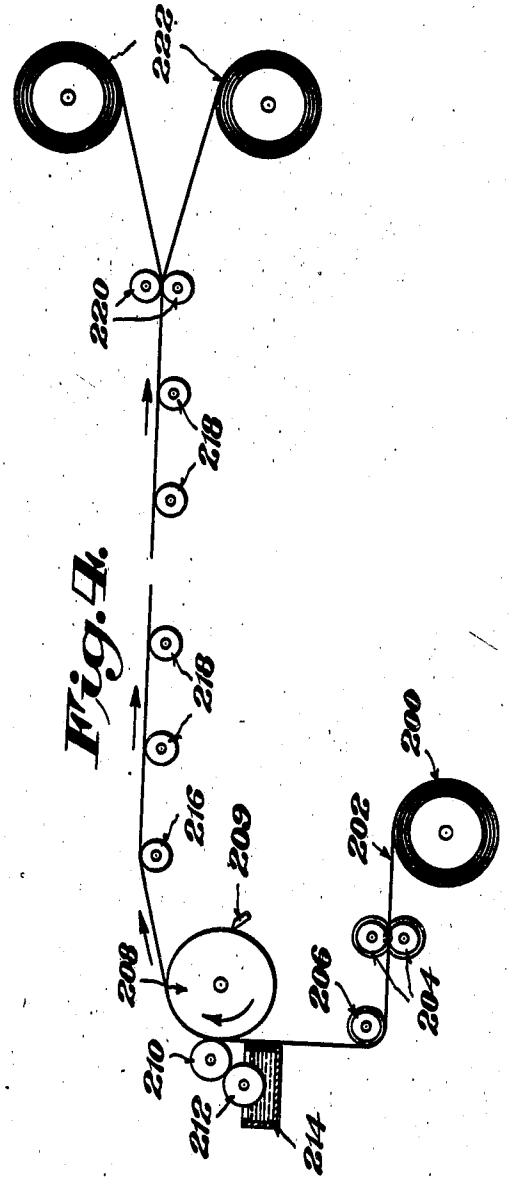


Fig. 4.

Inventor
Karl R. Karlson,
By Ross C. Hussey
Attorney

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PROCESS OF SLITTING AND COATING

Karl R. Karlson, Montclair, N. J., assignor to Union Bag & Paper Corporation, New York, N. Y., a corporation of New Jersey

Application May 26, 1941, Serial No. 395,305

2 Claims. (Cl. 117—4)

This application deals with the preparation of the material which is used to form the bags and to perform the process set forth in my application Serial No. 395,306, filed of even date herewith.

It is an object of this invention to provide a combined coating and slitting process whereby the coating material will not only form an impervious film on the surface of the web of paper to which it is applied, but will also form an impervious film completely sealing the edges of the slit strips.

A further object of this invention is to provide a method of coating and slitting whereby one entire side of the web is coated with an impervious film, the edges of the web are sealed with a similar film, and a similar film is applied to at least one margin of the reverse side of the web as an integral continuation of the film on the fully coated side.

These and other objects will be fully set forth in the following disclosure when taken in connection with the annexed drawings, in which—

Fig. 1 is a schematic diagram of an apparatus for carrying out one form of my process;

Fig. 2 is a schematic diagram in which there is added to the disclosure of Fig. 1 supplementary steps for forming a film over a part of the reverse side of the web;

Fig. 2*a* illustrates a detail of the arrangement diagrammed in Fig. 2;

Fig. 3 is a schematic diagram of another form of apparatus for carrying out my process in which the sequence of steps is changed from that of Fig. 1; and

Fig. 4 is a schematic diagram of still another form of apparatus for carrying out the same steps but in still another sequence.

Throughout this specification the term "thermoplastic material" is used to indicate a material which, under the action of heat and pressure, will act to seal together almost any combination of surfaces. As used herein, the term embraces such material dissolved in a suitable vehicle or such material, in the absence of a solvent, brought to a condition of fluidity under the influence of heat alone. When reference is made herein to "solidifying" the thermoplastic material, it is intended to include not only the cooling and solidification of a melted solid, in the absence of solvents, but also the driving off of a solvent so as to leave in solid condition a similar thermoplastic material. The process is fully workable whether the coating material be in solution or in a molten condition, and unless specifically stated otherwise both are to be included within the terms just discussed.

Referring now to Fig. 1 there is a supply roll 10 of paper 12 which is to be coated and slit into narrow widths. The paper 12 coming from the supply roll 10 passes over a tension roll 14 and then over a coating roll 16. An applicator roll 18 rolls in a vat of coating material 20 and applies this material to the web 12 as it passes over the coating roll 16. It will usually be desirable to supply a doctor 22 to clean the applicator roll 18.

There are available a great many mechanisms for applying a coating of material to a web of paper and the precise form of apparatus is largely immaterial in this process. It will be understood, of course, that, if the coating material is applied in solution, probably agitating means will be required to assure uniformity of the solution in the vat 20, or, if the coating be applied as a hot-melt, then, in addition to agitating means, thermostatically controlled heating means must be provided in the vat 20, and similarly thermostatically controlled heating means should be provided for the coating roll 16 and for the applicator roll 18.

From the coating roll 16 the web 12 passes between slitting rolls 24, each of which is supplied with a cleaning doctor 26. As the web 12 passes the slitter rolls 24 it is slit into a number of narrow widths. A cleaning doctor 28 is also provided for the coating roll 16. The strips leaving the slitters 24 are drawn over a spreader roll 30 which serves slightly to separate the strips. It is important in this process that the coating, whether applied as a solution or as a hot-melt, be maintained sufficiently fluid so that when the several strips are spread the coating material may flow over each exposed edge to form an integral film over these edges. Since the entire process takes place at high speed, that is from 800 to 1200 feet per minute, it will not usually be necessary to take any special precaution to maintain fluidity when the material is applied in solution. If, however, the material is supplied as a hot-melt, it may well be desirable to heat the slitters 24 and the spreader roll 30, or even to place a hood over this portion of the apparatus and to supply heated air for the purpose of maintaining fluidity of the coating. There is no general rule since the various types of thermoplastic materials have widely varying characteristics and will of course require specialized treatment to maintain the requisite fluidity in any particular case. Each,

however, will come within the basic principle that fluidity must be maintained.

In some cases it may be desirable to apply to the coated web a smoothing doctor 32 either over the spreader roll 30 or at any rate immediately thereafter in order to insure the deposit of coating material upon the slit edges. I wish to emphasize that the use of this doctor is not indispensable nor is it in all cases even desirable but for certain coating materials it may be helpful.

Depending primarily on the combination of web speed and the characteristics of the coating material, it may be desirable to supplement the coating of the exposed edges of the slit strips by providing additional coating means directly designed to effect a coating of the edges. This can be done by wicks, rolls, brushes or sprays acting to supply coating material directly to the slit edges after separation of the strips, or by directing at such points a hot blast to increase fluidity of the coating material adjacent the edges, or by the application to or adjacent to the edges, and by any of the foregoing means, of additional solvent for the purpose of increasing fluidity of the first applied coating material so as to insure a proper coverage of the raw edges.

From the spreader roll 30 the strips are given a long pass over table rolls 34 and in the course of this pass the coating material solidifies either by cooling, in the case of a hot-melt, or by evaporation of the solvent if the material has been applied in solution. The length of this pass will depend of course on the speed of the web, the quantity of coating material, and the characteristics of the material itself. The length of the pass can be reduced by accelerating the process of solidification, either by chilling, in the case of a hot-melt, or by heating and ventilating in the case of solvent evaporation. I have found, however, that in the case of a hot-melt, natural cooling is more desirable, since too rapid cooling may produce minute cracks in the coating and destroy its impervious character, or may tend, in the case of some materials, to make the coating brittle. It may, indeed, be desirable, in using a hot-melt, to hood a portion at least of the cooling pass and provide the hood with warm air so as to slow down the rate of cooling.

At the end of the solidification stage the strips pass between rolls 36 and are then separated alternately in the vertical plane and are wound up on spaced axes 38. It will be understood, of course, that there may be a number of coaxial rolls on each of the axes 38, but the strips would be alternately brought either to the uppermost or the lowermost plane.

In Fig. 2 the initial coating, slitting and solidification are accomplished precisely as illustrated in Fig. 1. In Fig. 2 there is a supply roll 50, a web 52, a tension roll 54, a coating roll 56, an applicator roll 58, slitters 60, and a spreader roll 62. As the slit strips leave the spreader roll 62, they go through a solidification stage and are supported on table rolls 64. At the end of the pass is a second spreader roll 66, from which the strips pass immediately over a second coating roll 68. A series of applicator rolls 70, supplied with coating material from a vat 72, register each with one edge of each of the strips, as more particularly illustrated in Fig. 2a. These narrow applicator rolls 70 serve to coat a narrow marginal path of each of the strips, and the rolls are so adjusted both as to width and position that they will be certain to merge the film which they apply with the coated edges of the strips. The strips then go through an additional solidification pass supported on table rolls 74 and are then wound up separately on axes 76.

This treatment is important in connection with the intended use of the coated strips. These are to be formed into bags and the bags will be used to form extremely impervious packages which may contain either liquids or evacuated solids. In order to form a simple overlapped seam in the bag, and to have the seam equally as impervious as the web itself, it is necessary to assure an integral unbroken mass of thermoplastic material throughout the interior surface of the bag. It is therefore indispensable that the edges of the paper be sealed since otherwise the raw edge, being exposed to the interior of the bag, would be sufficiently porous to destroy a vacuum, or if the package be filled with a liquid, or even a greasy solid, the raw fibrous edge would act as a wick and would feed the liquid or grease out of the package and into the walls of the bag.

A coating of a marginal strip on the reverse side of the web is desirable but not indispensable since the material could be applied in the course of manufacture of the bags rather than as a step in the original coating and slitting process. Depending, however, upon the type of bag machine and the speed at which operations are conducted, it will be more or less desirable to supplement the coating and slitting with the additional marginal coating step. No matter how it is applied, however, the material must be present on the reverse side and must merge and integrally join the material coating the exposed edge of the web, since otherwise the material of the web would function, through porosity or capillarity, to destroy the extremely impervious character of the package.

In Fig. 3 the solidification pass and reeling of the slit strips is identical with what is disclosed in Fig. 1 and discussed in connection therewith. The steps of slitting and coating, however, have been altered. In this figure I show a supply roll 100 and a web 102. The web 102 passes immediately between slitters 104 which slit it into a number of strips. These strips are then drawn over a coating roll 106 against which bears an applicator roll 108 supplied with thermoplastic material by a vat 110. A cleaning doctor 107 is provided and bears against the coating roll 106. From the coating roll 106 the slit webs pass over a spreader roll 112 which separates the strips sufficiently to permit the coating to flow over the cut edges. A cleaning doctor 111 is provided which bears against the spreader roll. The strips then are supported on table rolls 114 through a solidification stage, then go between rolls 116 and are separately wound up on spaced axes 118.

In Fig. 4, the solidification pass and the reeling up stages are identical with those of Figs. 1 and 3. In Fig. 4 I show a supply roll 200 from which is drawn a web 202. Web 202 passes between slitters 204 which cut it into a number of narrow strips. These strips then pass over a spreader roll 206 which slightly separates them, and the separated strips then pass over a coating roll 208 against which bears an applicator roll 210 fed by a supply roll 212 which rolls in a vat 214 of thermoplastic material. A cleaning doctor 209 is provided which bears against the coating roll 208. The separated strips are then drawn over a roll 216 and go through a solidification pass supported on table rolls 218. They then pass between rolls 220 and are separately wound up on spaced axes 222.

It is to be noted in connection with Fig. 3 that the slitting operation is done before any coating material is applied to the web, and it is further to be noted in connection with Fig. 4 that both the slitting and the spreading are accomplished before any coating material is applied. Generally speaking, it is advantageous to have as few operations as possible on the web after the coating, since the necessary fluid condition of the coating material makes gumming and fouling sufficiently probable to require close attention if these undesirable conditions are to be prevented.

It will, of course, be understood that the arrangements shown in Figs. 1, 3 and 4 may also be used in connection with the supplementary step illustrated in Fig. 2, and that the precise nature and arrangement of the apparatus is immaterial to the successful carrying out of the process.

Throughout the following claims, the sequence in which the various steps occur is immaterial unless expressly set forth. A comparison of Figs. 1, 3 and 4 will show that the sequence of steps of slitting a web in strips, separating the strips, and coating the strips is immaterial, and while it is grammatically impossible in the claims to recite the steps except in some sequence, the mere recital of steps in any particular sequence is not intended as a limitation except where, by the wording of the claims themselves, a particular sequence is specified.

So long as the application of thermoplastic to the paper occurs continuously, no regard need be had for the bag making process. The moment, however, that discontinuous sections of material are applied to the paper, the operation of the bag machine becomes a controlling factor. There is clearly no mechanical limitation which would prevent the addition to one or both sides of the paper of predetermined localized areas of thermoplasic which could be shaped and placed so as to cooperate in forming the bag bottom. When, however, the web reaches the bag machine, it would be necessary to compensate or otherwise adjust the passage of the web through the machine so as to synchronize the occurrence of the localized areas with the cutoff mechanism of the machine.

In most cases the bags, as actually sold, will receive ornamental printing which may run to three or more colors, and the recurring printed designs must also be synchronized with the cutoff in the bag machine, and for some purposes it will also be desirable to apply groups of perforations which will assist in forming the bag bottom.

The problem may be generalized by stating that either all localized operations, whether the application of thermoplastic, of ornamental printing, or of perforations, must either be done on the bag machine itself by means rigidly synchronized with the cutoff, or they must be done in a single operation with rigid intersynchronization of the several means. The commercial necessities will always dictate the procedure to be adopted. It is physically possible to add as further steps, to those illustrated herein, the operations of localized application of thermoplastic, of ornamental printing, and of perforating, but it is questionable whether the resultant machine might not be too costly for commercial operations.

What is claimed is:

1. A process of treating paper which comprises: continuously advancing a continuous web of paper; slitting said web into strips and applying to one entire side of said web a thin, superficial coating of thermoplastic material uniformly across the entire paper surface; thereafter separating said strips while maintaining said material in a sufficiently fluid condition to permit the same to form a thin, superficial film over the slit edges of said strips as said edges are separated, and thereafter solidifying said coating while maintaining said strips separated.

2. A process for treating paper which comprises: continuously advancing a web of paper, applying to one entire side of said web a thin, superficial coating of thermoplastic material uniformly across the entire paper surface, slitting said web into strips, thereafter separating said strips while maintaining said material in sufficiently fluid condition to permit the same to form a thin, superficial film over the slit edges of said strips as said edges are separated, thereafter solidifying said coating while maintaining said strips separated, and thereafter applying to one margin of the opposite side of each of said strips a coating of thermoplastic material while regulating the application of such marginal coating so as to insure continuity of the film of coating from the fully coated side around the exposed edge and over the margin of the opposite side of said web.

KARL R. KARLSON.