Nov. 2, 1943. J. L. GLICKMAN 2,333,369

COATING MACHINE

Filed Jan. 3, 1941

FIG. 1.

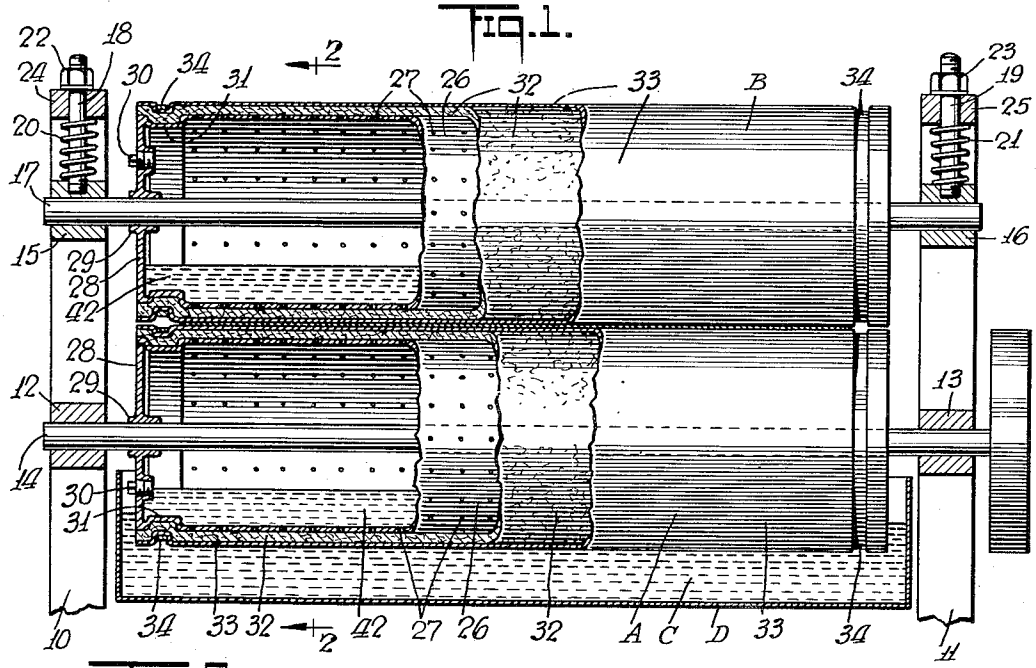


FIG. 2.

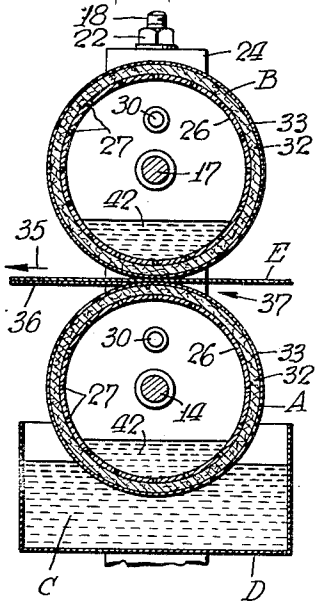
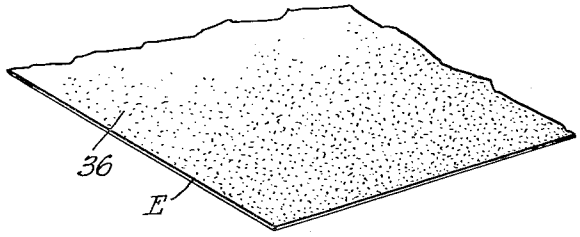


FIG. 3.



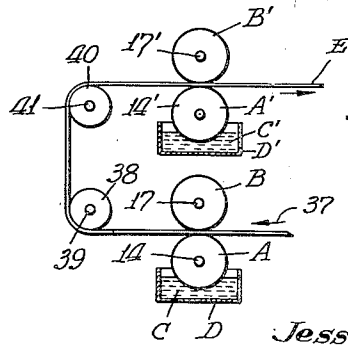


FIG. 4.

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COATING MACHINE

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2 Claims. (Cl. 91—49)

The present application relates to a coating procedure, and it particularly relates to an apparatus for applying latex to various types of fibers, textiles or porous webs.

Although the present invention will be particularly described in connection with the application of latex to relatively fragile sheet paper material having a low wet strength, it is to be understood that it has a broader application to the application of dispersions, emulsions or solutions of impregnating materials, whether they be plastics such as rubber or resin, or other impregnating materials, to other webs or sheets, and particularly to such webs or sheets which have a low strength when wetted or which cannot be readily sized, coated or impregnated with the particular material carried by the solution, emulsion or dispersion to be applied thereto.

More broadly the particular invention has a relatively broad application to the coating and sizing of fine porous loosely matted unsized paper, or similar fibrous textile or paper materials with latex, and less preferably with solutions, dispersions or emulsions of shellac, resin, starch, casein, clays, water glass, paraffin or other water-proofing emulsions.

In specifically illustrating the present invention in the application of latex to paper to form artificial or imitation leather or similar materials, it has been found that the best types of paper to be used as bases for such imitation leathers, particularly the unsized papers of high porosity, formed of loosely matted fibers, cannot be readily contacted with or immersed in liquid latex since the paper when so contacted or immersed in liquid latex tends to tear apart and disintegrate into a pulpy mass.

It has not been found satisfactory to provide continuous belts to support relatively thin weak paper webs during the application and impregnation thereof with the latex because of the tendency of the latex impregnated material to adhere to the belts and other supports and make it difficult to remove the paper web therefrom. Nor is it satisfactory to mix the latex with the paper pulp before the paper is formed into a web on a paper-making machine nor to treat the paper web preliminarily with a dilute latex before the final latex sizing.

All of these procedures not only involve expensive costly apparatus which is difficult to keep in running order, but they also do not produce a product of constant quality, and as a result a large amount of material is obtained which must be discarded because it is second grade or not salable.

It has not been found commercially possible to freeze the paper webs coated or impregnated with latex to give them sufficient strength to withstand further handling.

These difficulties are increased when vulcanizing ingredients and/or accelerators are added to the latex, or where it is necessary subsequently to treat the web with such vulcanizing ingredients or even with dyeing or coloring solutions subsequent to the application of latex thereto.

It has been found that where hard surface rollers are utilized to express the excess latex from the paper web or to force the latex into the fibers of the web, that a coarser product results than when soft felt rollers are utilized, and these hard rollers cannot be used to give a satisfactory soft product such as imitation suede. But, on the other hand, where such soft felt rollers are employed in order to obtain a finer product, there is a tendency for the latex or the latex impregnated web to stick to and adhere to such felt rollers resulting in tearing of the paper web or building up of the latex on the felt rollers to form uneven surfaces.

Moreover, it is quite difficult to obtain an even spread of liquid latex over the web with such felt rollers which will be free from blotches, streaks or other imperfections. These difficulties are not overcome even where wetting agents are incorporated with the liquid latex or even with the paper web before its impregnation with the latex.

It is therefore among the objects of the present invention to provide a simplified and improved mechanism for applying latex to paper webs as well as other sizing, impregnating or coating materials in solution, suspension, dispersion or emulsion generally to sheet materials, which will permit controlled application of the particular coating, sizing or impregnating materials without waste or excess and with assurance that an even spread of material will be obtained with a most satisfactory uniform impregnation over the entire sheet.

Another object of the present invention is to provide a mechanism for making improved imitation leathers such as imitation chamois or imitation suede without the necessity of using hard faced rollers or felt rollers, and with the assurance that the operation of the mechanism may be continued over long periods of time without tendency of the latex to spread unevenly over

the web and to give blotches, streaks or other imperfections or to cake the rollers.

Another object is to provide an improved mechanism for applying latex as well as other sizing, coating and impregnating materials in aqueous dispersion or emulsion to thin loosely matted fibrous paper webs, with assurance that such paper webs will not tend to break, tear apart or disintegrate into a pulpy mass, all without use of endless porous belts or foraminous carriers and without the need of resorting to expensive and costly pre-treating operations or refrigeration operations.

Another object is to provide a mechanism for preparing latex impregnated, losely matted paper webs, in which the vulcanizing ingredients and accelerators or dye materials may be readily included with the latex or incorporated in the impregnated paper without difficulty and without the necessity of utilizing several coating or impregnating operations to assure desired coating composition or amount of coating.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood however that this more detailed description is given by way of illustration and explanation only, and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

It has now been found that the above objects may be most satisfactorily accomplished by applying the latex or other similar sizing, coating and/or impregnating material to the paper web or sheet by a wetted roller, the surface of which is formed by a membrane permitting penetration and movement therethrough of water or crystalloids and which will prevent the movement therethrough of colloids.

Although many types of membranes may be utilized such as animal parchments, it has been found most satisfactory for the purposes of the present invention, to utilize vegetable membranes, such as parchment paper or sheets of dialyzing regenerated cellulose.

It has been found that a most satisfactory coating, impregnation or sizing may be obtained where such a membrane having dialyzing properties is supported by a relatively stiff, porous, water absorbent material, such as felt, which is interiorly continuously moistened with water so that the outer surface of the dialyzing membrane or parchment paper is kept moist at all times.

This dialyzing membrane coated felt roller is caused to pass through and carry a latex solution or similar impregnating coating, sizing, dispersion or emulsion up to the top of the roller where it contacts with a similarly covered roller also having a felt or other suitable absorbent soft backing with a covering of a parchment material or some other material having the properties of a dialyzing membrane. The latex will spread over or become adsorbed upon the moistened surface of the dialyzing membrane.

When the thin sheet of paper or web of loosely matted cellulose fibers is passed between the rolls, it is found that a most satisfactory impregnation, coating and/or sizing results without weakening of the paper and with a most desirable evenness of surfacing or impregnation and without waste of the latex or other sizing, coating or impregnating material.

Moreover, it has been found that in the latex there may also be included colors, pigments, vulcanizers and vulcanizing accelerators in desired quantities and regardless of whether these materials are included or not, the paper after having been passed between the rolls and given the desired sizing or coating, retains sufficient strength so that it may be immediately festooned or otherwise carried through drying and vulcanizing equipment without special carrier belts or special supports and without danger of its ripping, tearing or becoming pulped.

Referring to the drawing which illustrates several of the various possible embodiments of the present invention, but to which the present invention is by no means restricted, since the drawing is merely by way of illustration and not by way of limitation,

Fig. 1 is a front elevational view in partial section diagrammatically showing one form of an apparatus which may be utilized according to the present invention;

Fig. 2 is a transverse sectional view upon the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary perspective view illustrating the sheet after it has been coated;

Fig. 4 is a diagrammatic side elevational view on a small scale as compared to Figs. 1 and 2, of an arrangement for applying a surfacing or sizing to both sides of a single web or sheet.

Referring particularly to Figs. 1 and 2, there is shown the side supports or stands 10 and 11 which carry the bearings 12 and 13 for the shaft 14 of the lower roll A and the bearings 15 and 16 for the shaft 17 of the upper roll B. One of the bearing structures is preferably movable so that the rolls A and B may be pressed together.

As shown in Fig. 1, the bearings 15 and 16 of the upper roll B are supported by the studs 18 and 19 which are encircled by the coil springs 20 and 21 and held in position by the nuts 22 and 23 above the tops 24 and 25 of the side support structures 10 and 11. The cylinders or rollers A and B are preferably each of the same construction and they consist of a central shell 26 having the perforations 27 to permit water or other moistening liquid to pass outwardly through said shell.

The ends of the shell 26 are closed by the head members 28 having an enlarged portion 29 fixed upon the shafts 14 and 17 and with the plug 30 through which water or other moistening fluid may be introduced to the interior of the cylindrical shell 26. The shell adjacent the heads 28 is provided with a groove 31 and the entire shell 26 is encircled by the hair felt material 32.

The hair felt material is in turn encircled and covered by the parchment paper or similar dialyzing membrane member 33, which is gripped into the groove 31, together with the hair felt covering 32 by the snap ring or band 34.

The lower roller A will dip into the body C of liquid which is preferably latex which may or may not contain dyes, coloring materials, vulcanizers or vulcanization accelerators.

It is of course possible that such liquid C may also consist of various suspensions, emulsions, dispersions or solutions carrying other sizings, coatings or impregnating materials such as starch, flour, casein, resin, shellac, urea formaldehyde resins, water glass, paraffin, methyl cellulose, vinylite resins, soya bean proteins, clays, etc.

In one preferred form of the present invention, this solution at C received in the tank or container D consists of a liquid latex mixture hav-

ing a total solids content of approximately 62%, of which solids content about 65% may be hydrocarbon or rubber solids.

In this latex dispersion or emulsion or suspension there may also be included from 4% to 25% of a pigment or coloring material as well as other filling materials, vulcanizers or vulcanizing accelerators.

The water content of the latex will control the consistency thereof and the amount which will be carried upwardly by the lower roller A from the tank D, and the latex may be diluted or concentrated or provided with thickening agents, depending upon the amount of latex which it is desired to have applied to the paper web which is indicated at E in Fig. 2 and which is passing in the direction indicated by the arrow **35**.

It will be noted that as the web of paper E passes in the direction **35**, it will acquire a coating or surfacing indicated at **36** in Fig. 2 and also shown in Fig. 3.

Adjacent the point of contact between the upper roller B and the lower roller A, the excess latex will tend to pile up at **37**, and the pool of latex so formed will cause thorough impregnation of the web. At the point of contact, the rolls will press such latex thoroughly into the fiber or surface thereof and at the same time the paper sheet E, although wetted by the water in the latex solutions C, will not be torn, ripped or rendered subject to pulping.

Although the size, shape and weight of the rollers A and B and of the perforated base shells **36** may be widely varied, it is found desirable in one embodiment of the present invention to have an upper roller B weighing between 500 to 1500 pounds, with perforations arranged at a spacing of about 4 inches over the face thereof, and having a size of about 1/64 inch.

With very thin paper webs, such as unsized loosely matted porous papers, the latex will penetrate through to the other side, and it is only necessary to size it on one side.

In Fig. 4 is diagrammatically shown the manner of obtaining a surfacing or coating such as indicated at **36** in Figs. 2 and 3, upon both sides of the paper sheet E if the sheet E is not sufficiently porous to permit sufficient latex impregnation throughout upon application of latex to one side thereof. As indicated in Fig. 4, the paper will first pass in the direction **37** between the rolls A and B and be coated with latex taken up from the tank D.

Then the paper passes over the guide roller **38** having the shaft **39** and over the guide roller **40** having the shaft **41**.

Finally, the paper is passed between the rollers A' and B', carried by the shafts **14'** and **17'** of the same construction as previously described in connection with the rollers A and B of Fig. 1.

The rollers A' will pick up a latex solution C' from the tank D' and apply it to the other face of the sheet E that was contacted with the roller A in the first pass.

In this way the same or different sizing solutions may be applied successively to opposite sides of the paper or other fibrous web which is to receive the sizing, coating or impregnation.

During this entire operation, the parchment or dialyzing paper sheets **33** will be rendered moist by the water seeping from the pools **42** in the perforated shells **26**, through the openings **27** into the hair felt **32**. The latex at no time will wet or cling to the dialyzing coverings **33** and at the same time the paper sheet will not be substantially weakened or rendered subject to tearing, ripping or pulping. Although these shells **26** are preferably formed of steel, they also may be formed of other suitable materials.

The paper, after making one pass between the rolls A and B as shown in Figs. 1 and 2 or two passes, as shown in Fig. 4, may then be passed to a drier and/or vulcanizer, as the case may be.

Where instead of using a thin sheet of loosely matted fibrous paper as indicated at E in Fig. 2, a heavy type of board paper may be employed, it requires top sizing on one side only. The top roller B may remain dry or of different construction than the lower roller A, but wherever a thin loosely porous web E is employed, it is desirable to have both the lower as well as the upper rolls A and B faced with the continuously moistened parchment or dialyzing sheet.

By utilizing latex according to the present invention in connection with papers formed of loosely matted fibers, it is possible to obtain very high grade artificial leathers, which are supple and pliable, soft to the touch and exceedingly strong, and which may be dyed, stained, lacquered or otherwise treated to simulate real leather.

The final impregnated latex sheet is quite strong and may immediately be festooned or otherwise handled in driers even though it has not been subjected to any special treatment to toughen or strengthen it. It will have a uniform even sizing and impregnation of latex even though it has not been pre-wetted before impregnation and even though it has not been subjected to a succession of treatments with increasing concentrations of latex. It will have a smooth surface and may be readily imprinted with a smaller quantity of ink.

The paper web E has much more affinity for the latex size than the moistened parchment covering **33** of the rollers A and B with the result that the sizing material or latex will be solely taken up by the paper and there will be none taken up by the rollers A and B.

It has been found that the moistened parchment paper **33**, will take up an even layer of the latex emulsion from the bath. Apparently the layer of moisture or water which permeates through the parchment paper or other dialyzing membrane **43** forms a surfacing upon such dialyzing membrane, over which the latex emulsion will spread itself more evenly as the roller is moving up from the bath to the position of application, as indicated at **37** in Fig. 2.

This layer of latex which is carried up by the roller A to the point **37** indicated in Fig. 2, will then be applied to the sheet of paper E. This sheet E does not have to be pre-wetted or pre-moistened, and therefore will not be weakened before impregnation, and an even coating of the latex will be left upon the sheet of paper, as indicated at **36**.

The moisture which is deposited upon the opposite face of the sheet E from the upper roller B will aid in the impregnation and even application of the latex to the sheet E, as shown at **36** in Fig. 2, particularly in view of the fact that this moisture which is forced into the upper surface of the sheet E from the upper roller B will be applied at the same moment as the latex impregnation **36** from the main bottom roller A.

The latex solution which is carried up by the parchment paper **33** from the bath C to the point of application **37** apparently does not adhere to

the parchment paper **33**, but is separated from the parchment paper **33** by a layer of moisture, so that it is readily detachable and taken up by the sheet of paper E, with the result that on the down-coming face of the parchment surface **33**, there will be substantially no latex, as all of the latex has been taken up by the paper to be coated E to form the layer **36**.

This removal of the suspended latex rubber particles from the parchment paper on the roller A onto the sheet E will also be aided by the tendency of the two rollers at the point of contact to press moisture from the moistened felts **32**, which also causes the latex or rubber particles to be forced toward the paper sheet E to be sized. The moisture thus in effect which is passed into the felt **32** from the pools **42** and from the felts **32** through the membranes **33**, serves to release or more readily enable removal of the latex from the parchment **33** onto the sheet of paper A, as indicated at **36**.

The pressure between the rollers A and B also appears to force the latex into the paper E to be impregnated and strengthens it, and at the same time introduces into the paper a minimum amount of moisture which is necessary for proper spreading and adhesion of the latex C to the paper E at the point of pressure between the rollers A and B.

Although the paper sheet is moist as it passes in the direction **35** from between the contact of the rollers A and B, the paper web nevertheless is strong enough to be festooned or otherwise carried or passed through drying and vulcanizing equipment.

Even though there is substantial pressure at the point of contact between the rollers A and B, nevertheless this contact will not cause the latex to be forced back against the membrane **33** in view of the fact that they have been saturated with water and their water surfacing will press the latex into the fibers of the sheet of paper E to be impregnated.

As a result of this continuous moistening of the parchment faces **33** of the rolls A and B, it is readily possible to remove the impregnated or sized sheet E from these rollers in the manner indicated in Fig. 2 when it passes in the direction **35**, the water surfacing on the sheets **33** formed by passage of the moisture from the felt **32** serving to release not only the latex from the surface **33**, but also to release the sized and/or coated paper E from between the rollers A and B.

If desired, instead of including the vulcanizing, dyeing and other agents in the latex bath, the paper after it has been sized with latex without additions may then be passed through vulcanizing solutions, coloring solutions and various solutions to make the latex non-sticky, such as starch or alum. The alum fixed the dye, acting as a mordant, in addition to rendering the paper non-sticky.

The essential feature of the present invention resides in using a continuously moistened parchment or other dialyzing membrane carried on a roller or some other means to carry and apply an aqueous sizing emulsion, such as latex, to a surface to receive the same which may be paper or some other material.

The present invention thus eliminates the use of hard surface rollers and enables the obtaining of finer finish imitation leather products with relatively soft surface rollers. In spite of the fact that these rollers have a felt coating, they are protected from matting by the membranes or parchment coverings **33**, and any possibility of sticking of the sized paper or the latex itself to the felt base has been eliminated.

Even though the paper web has not been pretreated to strengthen it and even though no pre-wetting agents are employed, a most uniform and satisfactory surface of latex is obtained without any tendency toward over-sizing and without any waste of sizing material as often ocurs in immersing or spraying precedures.

The position and concentration of latex may be widely varied and various coloring, dye, filling, vulcanizing or accelerating ingredients may be included directly in the single sizing bath.

Many other changes could be effected in the particular features of coating procedures disclosed, and in specific details thereof, without substantially departing from the invention intended to be defined in the claims, the specific description herein merely serving to illustrate certain elements by which, in one embodiment, the spirit of the invention may be effectuated.

What is claimed is:

1. A latex applying apparatus for applying latex to absorbent sheets in the making of artificial leather, comprising two contacting rollers having a surfacing of parchment, a backing of felt and a hollow cylindrical perforated support for said felt carrying water to moisten said felt, and means for running the absorbent sheet of material to receive the latex between said rollers.

2. In a latex applying apparatus, a perforated metallic roller carrying a surfacing of felt and a covering of a dialyzing membrane, a tank in which said roller runs having a latex bath therein, and means for applying a sheet of material to receive the latex to the side of the roller opposite that side which runs in the latex bath.

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