

UNITED STATES PATENT OFFICE

2,117,199

MOISTUREPROOF COATED PAPER AND
PROCESS OF MAKING THE SAMEBert C. Miller, Montclair, N. J., assignor to Bert
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of New YorkNo Drawing. Application March 21, 1934,
Serial No. 716,643

8 Claims. (Cl. 91-70)

This invention relates to a moisture-proof hard adhesive coating for fibrous foundations such as paper or cloth and has for its object to provide a coating capable of making a cheaper and better moisture proof product.

Another object is to provide a flexible, non-cracking coating which is hard to the touch and adhesive.

Ordinary wax paper is somewhat moisture-proof but is unsatisfactory for making paper bags and the like because it possesses little if any adhesive qualities. In warm weather the wax may easily get scraped off to an extent lowering the moisture resistant character of the paper. Some of the nitrocellulose containing coatings of transparent wrappings are not as highly moisture resistant as is desired for some materials and these types of papers are expensive.

According to the present invention a coating for paper and the like is provided which is more moisture-proof, serviceable and cheaper than the paper having nitro-cellulose applied with a solvent. The aforementioned objections to ordinary wax paper have been eliminated and a strongly adhesive moisture-proof wax paper provided which is hard to the touch and not affected by climatic changes to anywhere near the same extent.

Specifically this invention contemplates a coating for a fibrous foundation which coating includes crepe rubber dissolved in wax to give the flexibility and good adhesive, a compatible resin being also added to provide a surface which is smooth and hard to the touch, and metallic soap being included to enhance the moisture resistant character of the coating.

By the term "coating" is meant the application of a film to one or both sides of a fabric such as paper web or cloth which becomes hard to the touch under ordinary atmospheric conditions but is at the same time flexible. By "laminating" is meant the coating or application of a film to one side only of the fabric and then bringing the coated side into contact with any material by pressure before the film is set, uniting and binding the two layers permanently together by means of the tacky coating. The laminated fabric may also be externally coated. The term "coating" is thus broad enough to include the film between the two fabrics or foundations of a laminated construction.

A feature of this invention includes the use of rubber dissolved in wax to provide elastic and adhesive film forming qualities when embodied

in the coating. It has been discovered that by taking pale crepe rubber and shredding or cutting the same into small particles, when the wax is heated to its melting temperature and the rubber agitated or worked into the wax that a substantial portion, possibly about 15% to 20% of the rubber appears to go into solution.

A large number of waxes such as the synthetic, animal and hydrocarbon waxes are appropriate for this purpose when heated and the rubber worked into the melted wax. This operation has been found to require expenditure of considerable time, possibly forty-eight hours or more to accomplish the desired result with the melted wax. Specifically a paraffin wax melting at about 103 to 110° F. has been used as has also a ceresine synthetic wax having a melting point of about 150° F.

After getting the rubber melted into the wax the other materials need only be added at a temperature of about 250 to 275° F. and the constituents stirred long enough to give the appearance of a balanced solution.

By way of illustration the following materials are used in about the following proportions to obtain a fairly moisture proof hard wax coating.

	Percent
Rubber-wax.....	5
Compatible common resin.....	60
Stearic acid wax.....	5
Metallic soap.....	20
Non-oxidizing oil plasticizer.....	10

The foregoing percentages are by weight. The resin is added so as to make the coating hard to the touch. Most of the resins are compatible although the phthalic anhydride and vinyl resins are generally not. The general term ester-gum is believed to cover compatible resins. The phenol-formaldehyde is modified so as to remove any possibility of its being toxic. Increasing the resin content of the coating makes the coat more brittle and more in danger of flaking off, while reducing the resin content causes the coat to lose its hardness to the touch as well as its gloss.

The stearic acid wax is not essential although its presence enhances the moisture-proof character of the coat and enables less metal soap to be used than might otherwise be required in order to obtain the same degree of moisture resistance.

In selecting an appropriate metal soap it is desirable to eliminate those which are toxic and those which are possessed of objectionable odor or dark color. The preparation of such a metal-

lic soap is well known to those skilled in the art and its preparation need only be referred to. For example, a soap preferably in powder or flake form and free of essential alloy, such as a neutral soap used in soap dyeing plants is dissolved in warm water when the appropriate salts of manganese or aluminum are added, the precipitate formed is separated, warmed and dried.

It is also desirable that a metallic soap be selected which does not tend to readily oxidize because otherwise it might cause the coating to crack although such tendency can be counteracted by increasing the amount of plasticizer used. When such a metal soap which does not too readily tend to oxidize is selected there is less danger of the coating material tending to build up on the rollers of the fabric coating machine. A high metallic soap content gives high moisture-proof character to the coat. The metallic soap also is believed to assist in giving the coat a gloss when it is well dissolved as a continuous film. Increasing the amount of metal soaps increases the tendency for the soaps to oxidize and for the coat to flake off in time. While no metallic soap may be entirely neutral to odor and color yet one is selected which is substantially so and sometimes a very little soluble blue dye is added to lighten the appearance if the metallic soap causes the coat to be somewhat dark. Reducing the content of metallic soap reduces the moisture-proof character of the coating.

Many other non-oxidizing oil plasticizers such as are well known in the art may be used in place of petrolatum, inasmuch as many such plasticizers are compatible. As previously mentioned the use of a plasticizer lessens the tendency of the coat to flake off when a considerable amount of metallic soap is used.

The stearic acid wax assists in making the coat long lived yet too much would endanger the coat with a tendency to crack.

The foregoing materials may be applied to a fibrous foundation with the aid of some of the well known quick drying solvents such as acetone, butyl acetate, although a preferred and less expensive manner of application is by the hot method, i. e. when the coating material is at a temperature of about 275° F. and passed through the usual coating machine rolls, followed by the use of a smoothing bar. In order to lessen the danger of the material sticking to the smoothing bar, better results are obtainable when the smoothing bar is heated say 20° or more above the temperature of the coating material. In order to prevent the wax from clouding and in order to form a more transparent coating, immediately after passing from the smoothing bar the coated material should be chilled.

While a substantial chilling to say zero degrees F. or 10 or 20 below is preferable, it has also been found that less chilling may suffice and the use of cold water passing through a chilled roller has sufficed.

Another composition for the coating of this invention is as follows:

	Percent
An ester-gum such as the modified phenol-formaldehyde resin.....	25
Stearic acid.....	5
Rubber containing wax.....	10
Metallic soaps.....	40
Non-oxidizing oil plasticizer such as petrolatum	20

In neither example are the percentages necessarily invariable as substantial leeway is possible

with each material. The preceding comments as to the effect of too much or too little of the materials does not refer to a mere quantitative change from the percentages indicated in either example but is intended to be an expression of functional change in the material from using too much or too little of the particular constituents.

The material of this invention such as that described in the second example given is highly moisture-proof and only one-half of one gram of moisture can penetrate a paper coated with this material on a basis of 100 square inches of coated paper surface in twenty-four hours at 70° F. and a relative humidity of 50. Under the same conditions a nitro-cellulose type moisture-proof paper absorbs about .7 to .8 of a gram which is substantially more moisture than can penetrate the coated paper of this invention. While highly moisture-proof the paper of this invention is not intended to be water-proof in the sense that it can be soaked indefinitely in water. A paper coated with the material of this invention has a higher polish than do the papers containing nitro-cellulose.

It is believed that paper coated according to this invention can be made and sold for less than half the price of papers containing nitro-cellulose and at the same time possess the greater moisture-proof character. By laminating a paper can be made as strong as desirable possessing the moisture-proof qualities of this invention. Unlike the ordinary wax this coat melts around 200° F. and does not soften an objectionable amount in hot weather.

The rubber helps make the wax and resin compatible in the film. By increasing the quantity of the rubber and wax a stickier, gummier, and more adhesive coat results. If too much is used there is danger of blocking, i. e. the adhesion of one sheet to another. Decreasing the amount of the rubber and wax reduces plasticity, binding action, and impregnation of the coat into the fibrous foundation.

As pointed out in my copending application Serial Number 716,504 filed March 20, 1934 for "Art of coating and laminating fabrics" it will be apparent how paper coated without the aid of solvents differs from that which is coated with solvents.

By flexibility is meant at least the ability to bend sufficiently to enable the coated material to be wound up without cracking as it comes from the coating machine. By hardness is implied such as is adequate to prevent the coated material sticking to an adjacent layer with which it is not intended to be stuck during the winding operation. The claims calling for a coated foundation are intended to cover a laminated structure since any one of two or more foundations in a laminated structure is coated. With the laminated product the coating material need not be so hard as is the case with an unlaminated product but in such laminated products the coating material must at least be hard enough to prevent the pressure on the material when wound up from squeezing it out from between the foundations.

I claim:

1. A fibrous foundation having a coating comprising a metallic soap to enhance the moisture-proof character of the coating, an ester-gum adapted to make the coating glossy and hard to the touch, a plasticizer and a stearic acid wax adapted to increase the moistureproof character of the coating without the use of as much metal-

lic soap as might otherwise be necessary to attain the same moistureproof character without the stearic acid wax, the proportions of materials in the coating being such that the foundation appears substantially transparent and possesses sufficient moistureproofness to allow not more than about one half of a gram of water per one hundred square inches of surface at 70° F. with 50° relative humidity to penetrate the foundation and coating in twenty four hours.

2. The method of enhancing the transparency of a moistureproof coating which is largely resinous, after the coating has been melted and applied while hot on a fibrous foundation, which method comprises smoothing the coat with a bar heated to a temperature above that of the melting coating material and then immediately chilling said coating.

3. The process for coating a fibrous foundation to produce thereon a highly moistureproof, smooth, hard flexible film which comprises dissolving crepe rubber in wax under heat and agitation, melting from about five to ten percent of the rubber wax material with from about twenty-five to sixty percent of compatible resin and about twenty to forty percent of a metallic soap to provide a balanced melt, applying the molten material to the surface of the fibrous foundation with a roll and smoothing the applied film with a heated smoothing bar.

4. The process for coating a fibrous foundation to produce thereon a highly moistureproof, smooth, hard flexible film which comprises dissolving crepe rubber in wax under heat and agitation, melting from about five to ten percent of the rubber wax material with from about twenty-five to sixty percent of phenol formaldehyde resin, about twenty to forty percent of a metallic soap and a small amount of wax in inverse proportion to the relative amount of metallic soap to provide a balanced melt, applying the molten material to the surface of the fibrous foundation with a roll and smoothing the applied film with a heated smoothing bar.

5. The process for coating a fibrous foundation to produce thereon a highly moistureproof, smooth, hard flexible film which comprises dissolving crepe rubber in wax under heat and agitation, melting from about five to ten percent of

the rubber wax material with from about twenty-five to sixty percent of compatible resin and about twenty to forty percent of a metallic soap plasticized with a non-oxidizing oil plasticizer to provide a balanced melt, applying the molten material to the surface of the fibrous foundation with a roll and smoothing the applied film with a heated smoothing bar.

6. The process for coating a fibrous foundation to produce thereon a highly moistureproof, smooth, hard flexible film which comprises dissolving crepe rubber in wax under heat and agitation, melting from about five to ten percent of the rubber wax material with from about twenty-five to sixty percent of a phenol formaldehyde resin, about twenty to forty percent of a metallic soap and a small amount of wax in inverse proportion to the relative amount of metallic soap plasticized with a non-oxidizing oil plasticizer to provide a balanced melt, applying the molten material to the surface of the fibrous foundation with a roll and smoothing the applied film with a heated smoothing bar.

7. As an article of manufacture a fibrous foundation having a highly moistureproof smooth, hard, flexible, fused film thereon which is composed of from about five to ten percent of a rubber wax mixture, from about twenty-five to sixty percent of a compatible resin and about twenty to forty percent of a metallic soap substantially identical with the product produced by the process of claim 3.

8. As an article of manufacture a fibrous foundation having a highly moistureproof smooth, hard, flexible, fused film thereon which is composed of from about five to ten percent of a rubber wax mixture, from about twenty-five to sixty percent of a compatible resin, about twenty to forty percent of a metallic soap and a small amount of wax in inverse proportion to the relative amount of metallic soap, which article has such moistureproofness that not more than one half gram of water will pass through one hundred square inches of surface at seventy degrees Fahrenheit and fifty percent relative humidity in twenty-four hours and substantially identical with the product produced by the process of claim 4.

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