

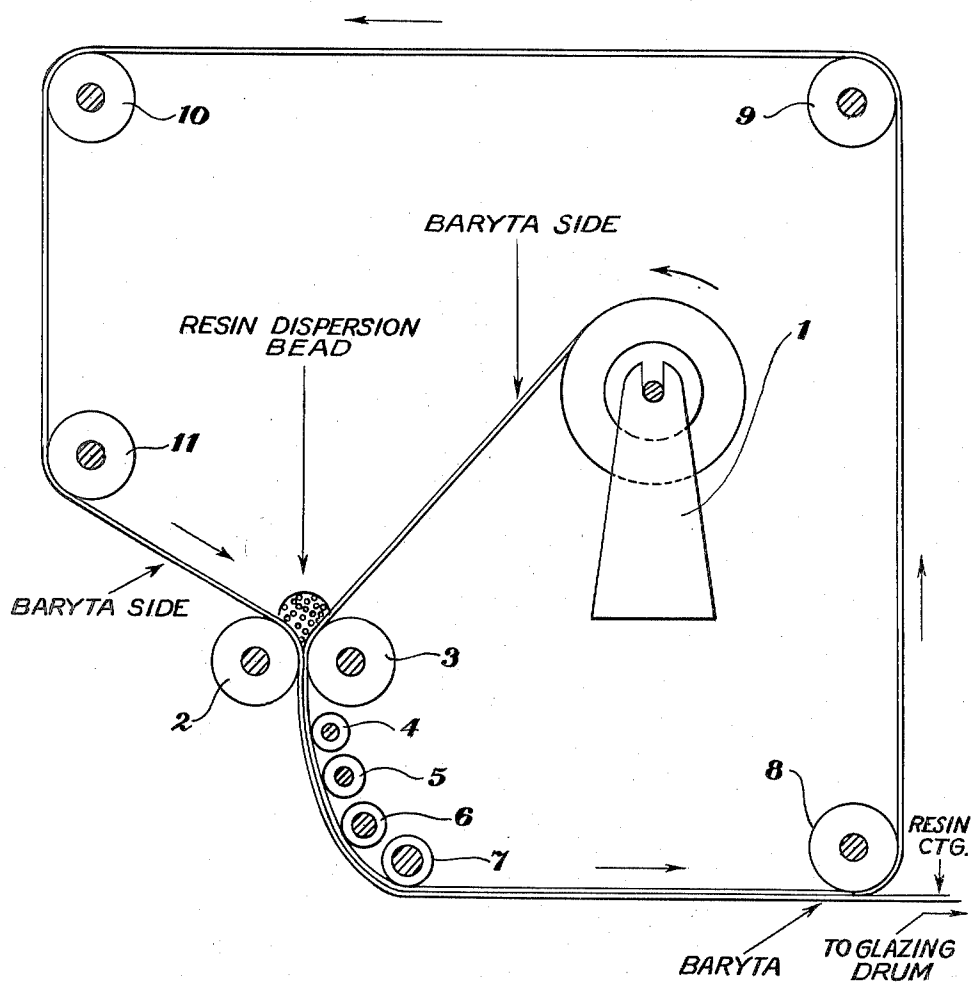
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H. C. STAEHLE

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METHOD OF MAKING WATERPROOF PAPER

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**Henry C. Staehle**  
INVENTOR.

BY *Samuel L. Maynes*  
*Henry E. Byers*  
ATTORNEYS

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## METHOD OF MAKING WATERPROOF PAPER

Henry C. Staehle, Rochester, N. Y., assignor to Eastman Kodak Company, Rochester, N. Y., a corporation of New Jersey

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This invention concerns the treatment of paper to improve its water resistance, more particularly the treatment of photographic paper to increase its resistance to aqueous processing solutions.

In the photographic art, various means have been used in the past to waterproof paper or to make it water resistant. However, some of these processes have been relatively expensive and are unable to compare favorably in cost to normally used photographic papers even though they result in substantial saving of time and equipment. Moreover, some of the waterproofing compositions may bleed or leach into the photographic emulsions causing fog or spots which are objectionable. Consequently, there has been a need for an inexpensive waterproof paper which would cost approximately the same as commercially available photographic papers, and which would be compatible with photographic emulsions.

Processing photographic prints using paper normally available requires considerable washing and drying inasmuch as the chemicals which are used in photographic processing tend to be absorbed in the photographic paper and must be removed by time consuming washing. Following this extensive washing, it is necessary to dry the prints to remove the water in order to present them in a finished condition. A waterproof paper would not absorb these chemicals from the processing baths and, therefore, would not require the long washing period or as elaborate washing equipment as is now in use. Moreover, certain intricate photo-finishing machines could be redesigned to make them smaller and to process photographic prints in a shorter time. One attempt to solve the problem of providing a waterproof paper has been suggested which involves coating the paper with wax which is compatible with photographic emulsions. However, when such a paper is rolled tightly on a drum, the surfaces tend to adhere to each other resulting in blocking of the sheets. Also, when such paper is cut on a paper cutter involving more than a single sheet the pressure required for the cutting knife may also result in blocking. On the other hand, brittleness should be avoided in photographic paper so that the paper may be rolled for handling. It should also be able to withstand temperature differences so that it may be used in northern climates or in the tropics. I have found a method of waterproofing paper which is compatible with photographic emulsions, and which provides a paper which is able to withstand the rigors of handling under various conditions. Moreover, it appears that this process can be carried out at favorable costs.

An object of this invention is to provide a waterproof paper. A further object of this invention is to provide a method of waterproofing paper. An additional object of this invention is to provide a coating method using a resin latex coating for photographic paper. Another object is to provide a water-resistant photographic paper compatible with a light-sensitive emulsion containing silver salts. Additional objects will be apparent from the spec-

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ification considered in connection with the attached drawing.

In the accompanying drawing, Fig. 1 is a diagrammatic view of a system employed for applying a waterproof coating to the back of a photographic paper having a baryta coating on its face.

In the embodiment for carrying out the lamination process on a single web of paper, the paper is wound on a supply roll and placed on supporting means 1. The paper web is led from the supply roll between two rollers 2 and 3. The paper continues against the guide rollers 4, 5, 6 and 7, around rollers 8, 9, 10 and 11 back between the two rollers 2 and 3 where the back of the paper contacts the baryta side of the paper. A resin dispersion is applied as a bead where the two surfaces pass between the two rollers 2 and 3. As the paper leaves the roller 8 where the two sheets are separated, the resin coating remains on the back of the paper. The baryta side is coated with the resin coating, laminated to a polished surface for about 30 seconds and peeled therefrom. The resulting paper has a waterproof coating on both sides.

More specifically, my waterproof paper is obtained by coating photographic paper stock which has been baryta coated on the face with a resin latex comprising a polymeric dispersion made from N-methyl methacrylamide, n-butyl acrylate, and acrylonitrile monomers. From about 10% to 40% of a polymer embodying these monomers is used. The composition of these monomeric constituents can be varied from 2% to 20% N-methyl methacrylamide, 40% to 60% n-butyl acrylate, and 40% to 60% acrylonitrile.

I have found that in order to provide a waterproof paper it is necessary to laminate the back of a photographic paper to the baryta side of another sheet (or the same sheet when operating with continuous lengths as illustrated in the drawing). As the two surfaces of paper are rolled in contact with one another, a bead of the dispersion is applied which forms a film of latex between the two sheets. After an interval of about 20 to 40 seconds the two surfaces are separated leaving the resin film adhering tenaciously to the back surface of that sheet. In order to waterproof the baryta side, that surface is glazed by laminating the paper with the same resin dispersion onto a polished chromium or other similar polished metal surface, allowed to remain in contact for 20 to 40 seconds and then peeled off. In this manner, both sides of the sheet are waterproofed.

My preferred method of coating is desirable inasmuch as a coating of this composition when air dried may contain considerable defects.

In my preferred embodiment, I used a resin latex representing 40 percent polymer of the following monomeric compositions:

8 percent N-methyl methacrylamide  
46 percent n-butyl acrylate  
46 percent acrylonitrile

The back of a photographic sheet having the face baryta coated was waterproofed using the above dispersion, by laminating against a baryta surfaced paper and peeling, after about 30 seconds. The baryta coated surface was waterproofed by coating with the resin, laminating to a polished chromium drum, and peeling after about 30 seconds. Both sides of the paper then carried a waterproof resin layer. However, water from the resin dispersions trapped in the structure of the paper was indicated by the limp quality of the freshly coated paper. The paper was hung in a vertical position under room conditions for two hours, at which time the paper appeared dry. A sample of the dried paper was tested by immersing a section for at least one minute in a strong

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solution of Rhodamine dye containing as a surface active agent, Triton N—100, which is an aryl alkyl poly-ether alcohol. The absence of pin holes was apparent since the dye layer was easily removed in running water. This test indicates the presence of pin holes by penetrating through the holes into the paper wherever these defects are present. Moreover the quality of the waterproofness was attested to by the length of time required for the water trapped in the paper to diffuse through the surface coating during the drying step.

I have found that the nature of the solvent added to the resin dispersion is extremely important. Ethylene chloride is the preferred solvent but other solvents such as ethyl acetate and benzol may be used. If a solvent, such as trichloroethylene, is used with the resin coating, too elastic a film is formed and at the time of pulling the two sheets apart will pull away from the back side in a spotty fashion to produce an unsatisfactory coating. On the other hand, the use of a solvent such as chloroform tends to produce a coating which is not sufficiently waterproofed, and which will absorb Rhodamine dye when tested as above.

I claim:

1. A method for coating the back of photographic paper, comprising laminating the back of the paper to a baryta coated paper surface by means of an aqueous dispersion of an interpolymeric composition comprising N-methyl methacrylamide, n-butyl acrylate and acrylonitrile, and separating of the two surfaces.

2. A method for waterproofing photographic paper having a baryta coating on one side, comprising laminating the back of the paper to the baryta coated paper surface with an aqueous dispersion of an interpolymeric composition comprising N-methyl methacrylamide, n-butyl acrylate and acrylonitrile, and separating after 30 seconds, applying the resin coating to the baryta side of the paper, laminating to a polished drum and separating after a period of about 30 seconds.

3. A continuous method for applying a waterproof coat-

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ing on a continuous web of photographic paper having one side baryta coated, comprising passing the paper between two rollers, moving the paper in a circuitous route so that it is passed between the rollers a second time, the back of said paper passing between the rollers in contact with the baryta coated side, applying an aqueous dispersion of an interpolymeric composition comprising N-methyl methacrylamide, n-butyl acrylate and acrylonitrile, at the point where the two sheets of paper meet, contacting the two sheets of paper in a laminated position for from about 20 to 40 seconds and separating the two sheets of paper.

4. A process according to claim 3 in which the paper having a waterproof coating on the back is coated with the aqueous dispersion of an interpolymeric composition, laminated to a polished metal drum for a period of from about 20 to 40 seconds and separated therefrom.

5. A process according to claim 4 in which the polymeric composition contains from 2 to 20% N-methyl methacrylamide, 40 to 60% n-butyl acrylate and 40 to 60% acrylonitrile.

6. A process according to claim 3 in which the polymeric composition contains from 2 to 20% N-methyl methacrylamide, 40 to 60% n-butyl acrylate and 40 to 60% acrylonitrile.

7. A process according to claim 2 in which a solvent selected from the class consisting of ethylene chloride, ethyl acetate, and benzol is added to the aqueous dispersion of the interpolymeric composition.

8. A process according to claim 4 in which a solvent selected from the class consisting of ethylene chloride, ethyl acetate and benzol is added to the aqueous dispersion.

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