

[54] PAPER FOR GRAPHIC ARTS

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UNITED STATES PATENTS

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[57] ABSTRACT

A graphic art paper composed of asbestos fiber, cellulose fiber and glass fiber and a cooperant partially cross-linked gelatin size, the synergistic mixture forming a non-puckering substrate for artists' water colors.

1 Claim, No Drawings

## PAPER FOR GRAPHIC ARTS

The invention relates to an improved paper for graphic art work, and in particular offers a novel surface for artists' watercolor paints having a non-puckering quality.

The invention delineates novel compositions useful for the preparation of products obtained therefrom and having particular usefulness to artists having needs for improved substrates.

The invention specifically teaches a paper product comprising randomly intermingled discontinuous fibers in the form of a highly dispersed mixture of cellulosic fiber and a combination of non-cellulosic fibers of papermaking length, i.e., glass fiber and asbestos fiber.

The direction improvements in the art of artists' supplies have thus far taken the route of improvements in the paints rather than in the substrates upon which same are employed.

Common substrates utilized as foundations for paintings and like graphic arts exhibit properties characteristic of their composition which are particularly undesirable so as to render the products wanting. The most pronounced and severe deficiency of prior art cellulosic papers for water colors is their innate property of puckering when a water based drawing is added thereto, detracting from or degrading the artists' colors or scheme thereof and the aesthetic properties and value of the paintings or other graphic works supported thereby. The affinity of cellulosic based papers for water and the consequential swelling results in this objectionable cockling of art papers upon the application of water paints or other water based agents.

Common art papers or organic based materials utilized as a foundation for paintings and the like graphic arts exhibit other properties characteristic of their composition which are particularly undesirable and render them wanting in this service. Another pronounced and severe deficiency of typical cellulosic art papers is their innate property of discoloring or yellowing with age which in time detracts from or degrades the artists' colors or scheme thereof and the aesthetic properties and value of paintings and other graphic works. Moreover, cellulosic based or containing art papers are highly vulnerable to moisture conditions and changes, and the harmful effects thereof comprising the absorption and presence of water with the accompanying swelling and shrinkage and the attendant water content and dimensional changes of the paper substrate contribute materially to the degradation of the painting, etc. and accelerate its general deterioration through decay, mildew, etc., or differential in expansion and contraction of the phases, wrinkling, cracking, etc., all of which limit and reduce the effective life of the object.

The usual solution to the puckering problem has been the time consuming one wherein the artist employs a stretching frame, first wetting and then drying his stretched sheet thereon all, of course, preliminary to the painting program.

Conventional artists' papers suffer in varying degrees from other common disadvantages in that they permit the paint to separate from the substrate when soaked in water and soak up excessive amounts of the paint applied in the filling of the pores of the substrate, even where such substrate has been previously primed, which disadvantages are reflected in the quality of the artwork applied to those papers.

Cellulosic-based art paper is simply vulnerable to moisture conditions and changes and their harmful effects, with an absorption of water accompanying swelling and shrinkage and with the attendant water content and dimensional changes of the substrate contributing materially to painting degradation. But worst of all, the affinity of cellulosic-based paper for water and the consequential swelling results in the aforementioned cockling or crinkling upon application of water paints or other water based agents.

The present invention overcomes these inherent difficulties and disadvantages.

It offers improved papers possessing stability and other advantageous characteristics for the enduring and unchanging maintenance of water color paintings comprised essentially of novel combinations of fibers and sizing, each of specific properties, whereby the synergistic mixtures provide unique papers of improved receptivity for graphic art materials.

The invention provides a paper allowing a water color foundation which is non-puckering, so as to constitute an enduring and lasting material for graphic recordings, the paper having substantial dimensional stability, with reduced swelling, shrinking, wrinkling, curling and cockling characteristics.

Herein is a graphic art paper having effective water resistance overcoming cockling and optimum rates of surface and internal water penetration enabling the application of water color paints with sharp, bold and clear strokes, and permitting the prompt washing off of any water based paints applied thereto so as to rectify mistakes or make changes.

The salient desideratum has been to achieve a sheet possessive of mechanical stability and inertness and yet possessive of hydrophylic properties.

In the formed sheet, both the glass and asbestos fibers contribute to its inertness to moisture, the glass fibers contribute to its stability, and the cellulose fibers provide the inherent hydrophylic properties.

We have fortuitously discovered the novelty in preparing an artist's substrate by the combining of organic and inorganic fibers according to formulations which have been developed within the following range of components:

| Constituents     | Preferred Range Weight | Percent by Weight |
|------------------|------------------------|-------------------|
| Organic Fibers   |                        | 40 ± 5            |
| cellulose fiber  | 40 ± 5                 |                   |
| Inorganic Fibers |                        | 60 ± 5            |
| asbestos fiber   | 45 ± 5                 |                   |
| glass fiber      | 15 ± 5                 |                   |
|                  |                        | 100               |

The basic raw material, cellulose, has natural characteristics which make it peculiarly adaptable to paper-making, once being hydrophylic, the cellulose fibers wet out readily when suspended in water to form a uniform suspension of individual fibers. When such suspension is subjected to appropriate mechanical action, as in a beater, the cellulose fiber splits, and fine fibrils are formed, which fibrils become highly hydrated. During sheet formation, these hairy fibers become mechanically entangled and are formed into a mat on the wire of the paper machine. In the final stages of water removal, surface tension forces draw the fibrils into sufficiently intimate contact to permit strong hydrogen bonds to form between adjacent fiber surfaces, all to the end that the dried sheet has a high degree of strength and integrity. The properties of cellulose-

based papers, however, have certain limitations because they are dependent entirely on the chemical and physical properties of the component carbohydrate fibers.

For the specialty paper herein contemplated, the effort is to keep the proportion of cellulose fiber at a minimum in order to achieve the desired stability for in truth, a sheet with no cellulose fibers would be ideal in attaining the desideratum of maximum stability.

Nevertheless, the drawing properties of the sheet are allowed by the cellulose fibers so that compromises have had to be made in achieving the specialty paper envisioned.

Glass and asbestos fibers on the other hand, are inert or insensitive to most outside influences and do not absorb moisture. Because of the rapid drainage rate when they afford, the introduction of glass fibers allows a faster production rate.

Diameterwise, the greater the diameter, the greater the stability and stiffness which are so much a part of the desideratum in the specialty sheet hereof. Nonetheless if the diameter is too great, a serious itching feeling and a gross scintillating effect are realized, both of which features are objectionable. A 3 to 13  $\mu$  diameter range represents the best in compromises.

The asbestos component comprises those fibers of asbestos of the group designated as chrysotile.

The internal sizing is of the "neutral" type precipitated onto the fibers by the use of one or more cationic agents. This material is mixed into the slurry of the fibrous furnish at a suitable point or operation, such as the beater, prior to sheet formation whereby the sizing is relatively uniformly distributed throughout the fibrous body.

The external or surface size, applied by a size press technique, comprises a dilute solution of a partially cross-linked gelatin, i.e., animal glue.

Various grades are available which are of high viscosity type and are essentially colorless.

Although emulsified types of size are available which provide acceptable surface fiber bonding and a necessary degree of hydrophilicity, the fact remains that the artist is familiar with the peculiarities of a gelatin type sizing as it relates to the "take" of the paint.

A better adhesion of water based paints is possible herewith than with the emulsifiable latices heretofore known.

The sizing serves to improve the mechanical properties such as tensile, mullen, fold, and the like and to tie down the fibers so as to allow a surface possessing the surface properties familiar to the artist, the artist being accustomed to a glue sized sheet.

With such sizing, the water colors do not penetrate through the sheet and a non-feathering edge is realized.

To the mass approximately 1.45 percent by weight of a sizing is added.

The anionic nature of the glass fibers and the cationic nature of the asbestos fibers permits a sheet which is less susceptible to rupture during the formation of the wet web.

Without limiting this invention to any theory as to the mechanism hereof, or function of the respective components, but rather for the purpose of illustration, it is believed that the marked upgrading of the strength and inertness to moisture of the paper, is due primarily to the cooperative effect of the specific combination of ingredients as the elimination of any one results in the loss of a basic property or function. For instance, the omission of the glass fiber results in a paper of lower saturating capacity and on the other hand, the absence of the cellulose fiber produces an appreciable loss in wet strength, whereas the novel combination of given materials provides a paper of enhanced capacity for non-wrinkling and of appreciably increased strength over any prior glass or asbestos fibrous papers.

Stated in another way, the paper hereof is composed of a major proportion of inorganic fibers (highly refined asbestos and glass fibers of fine diameter) and a minor proportion of organic fibers (cellulose fibers) containing a sizing.

Paper so composed can be conveniently formed in a conventional paper manufacturing procedure. For instance, the cellulose and asbestos and glass fibers along with the internal sizing, preferably in aqueous emulsion form, are mixed in the paper beater or other suitable pulping or mixing device, reduced to sheet form on a conventional papermaking machine, followed by the usual pressing and drying.

The paper may, if appropriate, include minor quantities of ancillary ingredients to augment or introduce other specific properties, as for example fillers and a variety of typical agents, so long as they do not introduce unwanted color and are not susceptible to yellowing, fading or other changes to degrade the brightness of the product or the functions of its respective essential constituents.

The foregoing illustrates the broad principles of the invention but it will be understood that modifications and variations may be incorporated therein within the broad spirit of the invention and the broad scope of the claims.

We claim:

1. A non-puckering permanent paper for graphic arts comprised of:

in approximate percentages by weight:

35 to 45 percent of cellulose fiber,

40 to 50 percent of asbestos fiber,

10 to 20 percent of glass fiber, to which mass 1.45 percent by weight of a size is added, said size comprises a surface size consisting of a dilute solution of a partially cross-linked gelatin.

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