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METHOD OF COATING AND ORNAMENTING PAPER AND THE LIKE

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Our invention is addressed to methods of surface treating paper or paper products, such as board and the like, whereby useful and ornamental results are accomplished. The treatment, of which we shall describe in these specifications and exemplary embodiment, enables us to obtain (in the aspect of practical utility) added proofness in the paper or paper product, particularly as respects resistance to water or moisture; and in the aspect of ornamentation, it enables us to secure a mottled effect in slightly or sharply contrasting colors, which is highly attractive in and of itself, subject to wide variations, and furnishes an excellent background for printed or other superposed designs.

These are the primary objects of our invention and we attain them and others which will be pointed out hereinafter, or will be apparent to one skilled in the art upon reading these specifications, by that certain series of process steps of which we shall now describe an exemplary embodiment.

Our invention comprises in its broadest aspect the treatment of papers or paperboards with watery emulsions of substances of gummy, resinous, bituminous, and the like character, and treating the surface of the paper or paperboard to a pressing, ironing, rolling or calendering operation under certain conditions which are productive of a mottled or grained appearance, which is highly ornamental. Hereinafter the word "paper" will be understood to include paperboard and similar products.

When working with a suitable emulsion, we have found it possible to combine the application of the emulsion and the rolling or calendering of the paper by coating the paper with rolls. In coating the under side of paper, we may provide a pan in which a quantity of the liquid emulsion is contained. A roll or a series of rolls, one of which dips into the liquid may be caused to form a film thereof and to transfer this film to a web of paper or board brought into contact with this film upon the rolled surface. If coating the upper side of the paper, we may lead it into contact with a roll and deliver a suitable quantity of the emulsion to the upper surface of the roll as by means of a pipe line from a pump or a reservoir. At the upper surface of the roll this pipe line conveniently can be directed along the axis of the roll and just below the top center where, through a series of small petcocks, any number of streams of emulsion can be made to impinge upon the upper surface of the roll. As an alternative, the pipe from the reservoir can deliver the emulsion into an over-flow pan which thus will deliver a thin falling sheet of emulsion across the upper surface of the roll or any selected portion thereof. A doctor is provided to limit the thickness of the film to be transferred by the roll to the paper.

When the emulsion in either a cold or warm condition is applied to paper with the rolls at substantially room temperature, or lower, or at the most with only warm rolls, a smooth uniform coating is produced, which after drying out is found to repel water to the extent that the treated paper beads. When the hot emulsion, say at 180° F. is applied with the rolls highly heated, as by steam pressure inside of them, the coating produced is not smooth but is mottled and gives a very distinctive grained effect to the paper. The mottled coating beads in the same manner that the smooth coating beads. In order to obtain this grained effect with the heated rolls, it is necessary to avoid heating the emulsion to that degree or for that length of time sufficient to drive off any substantial part of the liquid ingredients; thus, if the emulsion is allowed to boil for any great length of time before applying it to the paper there will be produced only a thick smooth coating, sticky compared with the smooth coating applied with cool emulsion and cool rolls. Having kept the emulsion substantially unchanged by preventing undue heating, and having supplied the rolls with the required heat, by means of steam or otherwise, a means of controlling the mottling is to so adjust the doctor on the top roll that a thin bubbling film of liquid passes down from the doctor into the bite of the roll where it merges with the body of hot emulsion floating on the surface of the sheet and gradually being drawn into the bite. Under these conditions, there is to be noted also that the emulsion has the appearance of being ready to break as it floats on the surface of the sheet at the bite of the roll. By maintaining a large pool of hot emulsion on the surface of the sheet, in front of the place where it enters the bite of the roll, the character of the mottled or grained effect obtained can be controlled. Within certain limits, the larger this pool, in area, the further back it extends from the bite of the roll, the more pronounced is the grain or mottle obtained.

A suitable exemplary emulsion (which may

also be referred to as a sizing layer) may be made as follows:

125# rosin, preferably gum rosin.
Heat to 450° F. and sieve in 6 oz. lime.
When dissolved add
10# paraffine.
Let cool to 375° F. and add
85# varnolene.
Let cool to 200° F. and add
6# caustic solution.

This caustic solution comprises

600 grms. caustic soda
300 cc. water.
When dissolved weigh in
2250 grms. Pyro alcohol.

The emulsion obtained from this formula contains two emulsifiers, sodium resinate which tends to form an oil-in-water emulsion, and calcium resinate which forms a water-in-oil emulsion. This sizing liquid weighs around 8 pounds per gallon and comprises a clear dark brown liquid smelling strongly of varnolene and rosin and with the consistency of a thin lubricating oil. When emulsified with an equal volume of water, by adding somewhat less than an equal volume of water to the liquid and agitating, heating and making up to an equal volume of water by means of a jet of live steam, there is formed a brownish, milky looking liquid which separates rather quickly into two layers, neither of them being clear. After standing for a while the lower, or water, layer clears up, while the top layer, which is the water-in-oil phase, does not separate. Apparently herein lies the secret of the mottling properties of the sizing liquid, it being the breaking up of this water-in-oil phase that causes the grain in the ultimate coating.

A typical example of the operation follows: 50% each by volume of the emulsion liquid and water were mixed together and heated by the use of live steam, the live steam serving to assist the agitation of the liquids. As incorporated, the emulsion had a temperature of 180–190 degrees F. This emulsion then was poured into the bottom pan of the combining rolls and sufficient steam pressure applied to the rolls to give them a surface temperature of 240–250 degrees F. as measured with a contact pyrometer. The sheet being fed through the rolls comprised a laminated product with outside liners of highly sized kraft paper and filler plies of other paper, the various plies having been combined with hot asphalt on a portion of the combining machine through which the paper plies passed before coming to the coating rolls. Because of the use of molten combining asphalt, at 325–350 degrees F., the combined sheet was very hot. This heat served rapidly to dry the emulsion as it was applied. The body of emulsion lying across the sheet at the bite of the rolls showed a temperature of 184 degrees F., whereas, the emulsion in the pan was at 202 degrees F.

The above example had to do with the mottling of a plied paper combined by the use of hot asphalt which gave the drying effect on the mottled coating. The outside layers of the paper were stated to be highly waterproof kraft. It is not to be assumed from this that the mottling effect can be gained only in highly waterproof paper; but it should be noted that the higher the initial waterproofing of the paper the more pronounced and striking is the mottle imparted. For example, two different kinds of kraft paper, each .016 inch thick, were given mottled coatings under identically the same conditions. In the case of the highly sized paper the coating was much more pronounced and sharp than in the case of the under-sized paper. Neither is it to be presumed that the mottle can be applied successfully only to heated paper because this is not the case. While such heating is advantageous, the mottled coating can be applied to thin sheets of paper at ordinary temperatures or boards at ordinary temperatures, which have been combined by adhesives other than molten asphalt or the like.

Another formula, but without limitation, is an emulsion comprising the following:

	Parts by weight
Rosin	500
Boiled linseed oil	100
Ester gum	1
Kerosene	400
Emulsifier	5

A satisfactory emulsifier is triethanolamine. This is used in the same manner as the one previously described.

Modifications may, of course, be made in our invention without departing from the spirit thereof; and equivalents may be employed in our formulae.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. A process of treating paper which comprises forming an emulsion of a gummy material and water, containing flocculated and deflocculated particles, heating said emulsion, and applying it to the surface of paper in a thin film.

2. A process of treating paper which comprises producing an emulsion of a gum, an oil, and a liquid material immiscible with water containing flocculated and deflocculated particles, and applying the same to paper while heating the said emulsion.

3. A process of treating paper which comprises making a mixture of rosin, linseed oil, a gum, kerosene, and an emulsifier, agitating the said mixture with water to form an emulsion containing flocculated and deflocculated particles, and applying said emulsion to the surface of paper in a thin film, said emulsion being at a temperature near the boiling point of water.

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