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PROCESS OF MANUFACTURING PHENOL-FORMALDEHYDE RESIN SHEETS AND FORMS

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This invention relates to improvements in processes for manufacturing phenol-formaldehyde resin sheets or forms, and has more particular relation to the manufacture of such sheets or forms impregnated with mica or other similar hard insert substances.

The object of the invention is to so impregnate the basic stock or laminations of paper with mica or its equivalent, that when the phenol-formaldehyde resin solution is added and the whole heated and pressed, a highly electrical resistant homogeneous board will be formed.

Another object of the invention is to provide for the colloidal dispersion of mica throughout the basic paper fibres or pulp stock to secure a uniform dispersion throughout its entire pulp.

A further object of the invention is to so reduce the cellulose content of the finished product as to greatly reduce the hygroscopicity of the product and thus reduce any tendency to water absorption.

The invention also has other objects, all of which will be hereinafter more particularly set forth and claimed.

Described in general terms, the invention primarily relates to the use of mica, or its equivalent, in finely divided form to be uniformly dispersed throughout the basic stock of paper pulp which is to be made into paper for subsequent impregnation with a synthetic resin varnish, these impregnated sheets to be wound on a heated metal mandrel and formed into tubes, or if boards are desired, formed into sheets which are superimposed, one upon the other, and subjected to pressure in hot presses to form a homogeneous, dense sheet wherein the resin is rendered infusible and insoluble.

In preparing the mica for its incorporation into the paper stock, it is preferably mixed with water to form a colloidal paste by means of a colloid mill, pebble ball or other suitable grinding or mixing device, and when properly dispersed the resulting paste is added directly to the paper pulp in the beater. For this operation, just enough water should be used to form a mixture of pasty consistency as this will tend to form a homogeneous mixture of uniform particle size.

The amount of mica used can be varied between rather wide limits, depending on the characteristics desired in the resulting sheet, but the inventor prefers to use from 10% to 30% of mica, based on the weight of the fibre as this gives a sufficient range to work to.

About 5% to 10% additional mica is added over that desired in the finished sheet to allow for loss by drainage through the wire screens of the paper machine. These figures will vary considerably with the type of equipment, speed of the machine and the mesh of the wire used.

In order to obtain a fairly soft sheet for impregnating, it is advisable not to use more than 10% to 15% of mica.

An emulsifying agent may be used in the mica water mixture as this will aid in obtaining a uniform dispersion. By keeping the mixture on the alkaline side, better results will be obtained until the mica paste is added to the pulp.

The stock in the beater is then just neutralized with alum, care being taken that no residual salts remain in the pulp.

The paper stock above referred to may be kraft, news, rag, alpha, sulfite, or any fibrous material in pulp form which can be used to make a sheet for impregnation with a synthetic resin for the purpose of producing sheets or tubes.

It, of course, will be understood, that after the paper pulp has been formed into sheets by passing through a paper making machine, that these sheets will be uniformly impregnated with finely divided mica.

When these sheets are subsequently again impregnated with a phenol-formaldehyde resin varnish, and subjected to heat and pressure in a manner well known in the art, a dense highly electrical resistant sheet is formed which is both infusible and insoluble, and which can be worked or operated practically the same as synthetic resin sheets now well known in the art.

The usual well known electric resistance of the phenol-formaldehyde resin sheet is,

of course, greatly increased by the presence of the finely divided mica, homogeneously through the entire sheet.

Further, the presence of the finely divided mica in the paper fibre results in a great reduction in the cellular area of the sheet and the well known resistance to water absorption of such phenol-formaldehyde resin sheets is thus greatly increased.

It will also be understood that the impregnated paper pulp with its mica content is solidified and locked with a dispersement of mica permanently held by the phenol-formaldehyde process which follows the mica impregnating process and any tendency of the mica to move in the cellular structure of the paper stock is thus avoided by the dense structure of the phenol-formaldehyde resin locking process.

It will further be seen that by decreasing the cellular content of the sheet and dispersing the cellulose fibres so as to fill them with mica, the electrical qualities of the finished product are greatly increased. Further, mica being an inert substance of greater specific gravity than cellulose fibre, will tend to make a more dense product which will materially improve its mechanical characteristics and secure a more solid structure and one that may be more highly finished.

The presence of the mica in the paper pulp will also tend to increase the heat resistance of the finished product.

Further, the content of mica in the finished product will, of course, reduce the quantity of phenol-formaldehyde resin as compared with the 100% cellulose fibre sheet.

Having thus described my invention, what I claim is new and desire to secure by Letters Patent is

1. The process of impregnating phenol-formaldehyde resin sheets with mica or similar substances which comprises first finely dividing the mica, adding water thereto to form a colloidal paste, adding this paste to the paper stock, finishing the paper stock, impregnating these sheets with phenol-formaldehyde resin varnish and subjecting superimposed sheets to heat and pressure.

2. The process of impregnating phenol-formaldehyde resin boards with mica which consists in first uniformly dispersing it throughout a fibrous paper stock, second, forming the stock into sheets in a paper machine, third, impregnating the sheets with phenol-formaldehyde resin varnish, and fourth, subjecting a number of superimposed sheets to heat and pressure to form boards.

3. The process of impregnating phenol-formaldehyde resin boards with mica which consists in adding mica combined with an emulsifying agent and water to a suitable paper stock, finishing the stock into sheets, impregnating the sheets with phenol-formaldehyde resin varnish and subjecting a series of superimposed sheets to heat and pressure to form the boards.

4. In impregnating phenol-formaldehyde resin boards with mica, the process of first impregnating the paper stock with mica and water mixture, neutralizing the stock with alum, forming the stock into sheets and impregnating the sheets with phenol-formaldehyde resin, and heating and pressing the sheets into boards.

5. The process of impregnating phenol-formaldehyde boards with mica which consists in dispersing finely divided mica throughout a paper stock, forming this stock into sheets, impregnating the sheets with a phenol-formaldehyde resin mixture and subjecting superimposed sheets to heat and pressure to break down the cellular structure and cause the mica to consolidate and form a dense nonwater absorbing structure.

6. The process of impregnating phenol-formaldehyde resin boards which consists in first impregnating a paper or fibrous stock with mica in uniform colloidal dispersion, forming the stock into sheets, impregnating the sheets with phenol-formaldehyde resin and finally heating and pressing the sheets with sufficient pressure to lock the mica in the cellular structure of the paper stock by means of the surrounding resin.

7. A product comprising laminations of paper stock impregnated uniformly throughout with finely divided mica and phenol-formaldehyde resin surrounding the mica and filling the cellular structure.

In testimony whereof I affix my signature.

GEO. J. CROSSMAN.