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NONABSORPTIVE MATERIAL

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This invention relates to covering materials and more especially to covering materials of the type which tend to absorb moisture from the atmosphere. The invention particularly relates to covering materials of fibrous absorbent structure and to fibre boards and to wall boards which have fibre in their composition.

In materials of the type referred to, it is well known that the absorption of moisture from the atmosphere occurs either because of the ability of the fibres themselves to take up moisture from the air, or because the character of the structure of the material formed of the fibres is such as to induce the absorption of the moisture. In fibre board materials, such as those used for wall coverings and panels and for decorative purposes which are generally composed of cellulose fibres, the absorption of moisture results in expansion and contraction of the material with changes in the temperature and the moisture content of the air. When such changes in dimension of the paneling or wall boards take place, the material may pull out from its fastenings or slide out from under the batten stripes covering the joints between panels or may otherwise deform and spoil the appearance or weaken the structure of which it forms a part.

In order to reduce this change in dimension, it heretofore has been proposed to incorporate in the stock of fibre from which the covering materials or panels of wall board are made, a sizing material which will reduce the absorption of the moisture. It also has been the practice heretofore to apply a surface size upon the face of the sheets of the material in order to seal these surfaces as far as possible against the entrance of moisture into the fibrous structure or fibres themselves.

The present invention has for its object the improvement of all such materials by further treatment of the sheets or panels of the covering material or wall board which heretofore have been left in the form which results from cutting the material into sheets or panels. In such materials as heretofore manufactured, the cut edges form surfaces of the fibrous structure of the sheet or panel and this structure and the fibres themselves are exposed to the air. I have found that a considerable amount of moisture may enter the material through these edges. According to my invention therefore, I apply to these edges of the sheet or panel a moisture resisting coating so as to seal the edge against the entrance of moisture. In order to obtain this result I adopt a method of applying coating so that substantially the edge

surfaces alone are covered with the water resisting coating and this coating does not become applied to the face surface of the sheet or of the wallboard. I then am able to secure prevention of entrance of moisture through the edges of the sheet or panel without changing the appearance of the covering material or wallboard and without the necessity of treating the face surface in any special manner other than the usual treatment with sizing.

In order to carry out the method of the invention I take advantage of the practice of piling sheets of covering material such as wallboard panels in piles. To obtain the results which are the object of the invention, however, I am careful to pile these sheets so that the edges of successive sheets substantially match, in order that the face surfaces of each sheet substantially will be covered by the sheet adjacent thereto. Thus substantially only the edge surfaces are exposed and these surfaces form substantially a continuous surface which may approximate a plane surface, although within the scope of the invention successive sheets may be so placed one upon the other that the resulting surface formed of the edges of the sheet may be curved. This may be accomplished without substantial exposure of the face surfaces of the sheet.

When the sheets or panels have thus been stacked in a pile with the edges thereof matching, I apply a coating of sizing material to these edge surfaces by means of a brush or with spray guns. The material is applied over the whole of the integral surface formed of the edge surfaces of the sheets. By systematic treatment a substantially uniform coating of the sealing material or sizing may be applied upon this integral surface and, therefore, may become substantially uniformly spread upon the edge of each sheet or panel. In order to secure as uniform a distribution of the coating as possible, I adopt the method of traversing the spray gun over the surface in a systematic manner, for example, horizontally along the upper edge of the pile covering a surface band extending in a horizontal direction and then stepping down at the end of the band to the next lower area or band, covering this lower band or area with an application of coating or sizing while proceeding toward the opposite side of the pile, stepping down and proceeding in a direction parallel to the first band and so on until the whole of the integral surface is covered. Similar systematic application of the material by means of a brush may be carried out.

To make clear the invention and the results

which may be obtained thereby, I give below the composition of a coating or sizing material which I have used and applied to fibre board. Following also is a table of tests which I have made to show the absorption of water by fibre board material through the edges to which such a coating or sizing material has been applied, in comparison with the absorption of water by such fibre board without having the edges thereof so treated. The fibre board to which the results indicated below relate is formed of layers laminated together. The outer layers are composed of ground wood fibre stock with sulphite stock added thereto. The inner layers are composed of waste paper stock with ground wood added thereto. Thus this fibre board is formed of a plurality of layers, each of which is formed of a plurality of plies of such fibrous stocks. The face surfaces of such fibre board were treated in the normal manner with a varnish size to provide water resistance and the stock itself was sized before delivery to the paper making machine on which the plies and the layers were made. The layers were laminated together with an adhesive made from starch as a base.

The composition of the coating or sizing material for application to the edges of the fibre board may be designated as plasticized lacquer and, for the purpose of the tests referred to and for edge coating fibre board of the type described above may be made up in the following formula:

Formula for plasticized lacquer

		Percent by weight
35 Cotton solution	Dry nitrated cotton	15.10
	Alcohol	6.44
	Butyl acetate	19.40
	Toluol	19.40
Lindol (tricresyl phosphate), plasticizing material		5.02
40 Gum solution	Ester gum	7.73
	Toluol	5.88
	Butanol	1.11
	Butyl acetate	2.42
45 Thinner	Ethyl acetate	4.90
	Toluol	12.60
		100.00

A further feature of the invention relates to the treatment of the edges of the material, particularly of felted fibre wallboards, fabricated as described above. Many such covering materials of fibrous composition are commonly cut into sheets by means of shears or rotary cutters. While the application of the coating or sizing material, such as the plasticized lacquer the formula for which is given above, is effective to increase the resistance to the entrance of water or moisture through the edge of the sheet, I have found that an improved result is obtained by first forming the edges of the sheet with a smooth surface and, particularly one which is made smooth by a grinding operation. For this purpose I have found that a sand wheel acting against the edge of the sheet as it is moved forward in a trimming machine produces a texture of the edge surfaces which may be designated as "smooth" and in which the fibres have been cut off substantially evenly, that is so that their ends, for the most part, lie substantially in a common plane. In the claims, the word "smooth" therefore represents a surface which either by such grinding operation or by a suitable cutting operation has produced such a surface of even fibre projections. I have found that the appli-

cation of a coating or sizing material, such as the plasticized lacquer, upon such a "smooth" surface and especially upon such a ground surface is effective to obtain a marked increase in the sealing of the edge against the entrance of moisture.

To show the improvement which may be obtained in the resistance to water absorption by thus treating the edges of fibre boards the following tests were made. In these tests the test samples have been specially treated upon both face surfaces thereof with a coating of lacquer and then a coating of paraffin. In these tests the faces of the board were thus sealed as completely as possible against the entrance of moisture so as to measure alone the effect of treating the edges of the board. The test samples were prepared from fibre board of particular manufacture known as "Beaver" fibre wall board, having four layers each composed of six plies, and having a thickness of $\frac{3}{8}$ ". The samples were cut into 6 inch squares and subjected to complete immersion in water in suitable containers. In all cases, the edges of the board were sanded or ground to the smooth surface which has been described above.

Description of sample	Absorption of water when immersed		
	1 hr.	2 hr.	24 hr.
"Beaver" fibre wallboard with both surfaces lacquered and paraffin coated—edges sanded only	Percent 0.85	Percent 1.26	Percent 5.20
"Beaver" fibre wallboard with both surfaces lacquered and paraffin coated—One coat plasticized lacquer of above formula brushed on edges	0.34	0.66	4.4
Two coats of the above lacquer brushed on edges	0.22	0.29	2.0
Three coats of the above lacquer brushed on edges	0.12	0.19	0.65
Five coats of the above lacquer brushed on edges	0.05	0.12	0.28

The above table shows a marked reduction in the amount of moisture which is absorbed through the edges of the board. While the faces of the boards as ordinarily manufactured are not sealed by the application of lacquer and paraffin, which for the purposes of the tests were applied to prevent absorption through these faces, and while the faces of the product as manufactured permit the absorption of some moisture there-through, nevertheless the substantial reduction in the amount of moisture absorbed through the edges of the board is important. While the boards are in storage they are stacked in piles and, except for the outside boards, the faces of the boards are not exposed to the air for absorption of moisture therethrough. Moreover in most cases after such fibre wallboards are erected in place they are painted upon the faces thereof or otherwise covered thus reducing the amount of moisture which may enter through the face. It will therefore be understood that the improvement in the resistance to absorption through the edges of the wallboard as provided by the present invention, and particularly in that form thereof which utilizes the sizing or coating upon these edges which first have been sanded or ground or otherwise made smooth, constitutes an important advance in the art.

The comparison between the board having the edges sanded in the manner described and board which is merely cut with a slitter type cutter is shown in the following test in which the samples also were made from board of $\frac{3}{8}$ " thickness and

which were 6 inches square. After the faces of the board were coated with a coating of lacquer and then a coating of paraffin, as in the first tests given above, the edges of these samples were given two coats of the plasticized lacquer, the formula for which is given above. The following results were obtained in the immersion test:

Description of sample	Absorption of water when immersed		
	1 hr.	2 hr.	24 hr.
	Percent	Percent	Percent
"Beaver Board" with both face surfaces lacquered and paraffin coated.			
Sawed and sanded edges with two coats of lacquer.	.20	.31	2.48
Slit edge with two coats of lacquer.	.38	.58	4.33

It will be clear from these data not only that a marked improvement is made in the resistance to absorption of moisture or water when coatings of the lacquer are applied to the edges of the wallboard but that when the edges are first sanded or ground a still further improvement is obtained which itself is of marked degree.

In the claims by the term "absorbent structure" I mean a structure of felted fibers which will absorb moisture from the air as well as by actual contact with a mass of water. Within the scope of the term "absorbent structure", when applied to material such as wallboard composed of cellulose or other fibers which have been felted as on a paper machine to form the board, I include a material in which such fibers have been treated with water resistant sizings during their manufacture into a web on the machine to make the fibers themselves as resistant as possible to the absorption of moisture. It has been found however that such materials even though the fibers thereof are so treated still absorb moisture from the air or by contact with a mass of water and the invention provides for protection of the covering material and of the fiber from such absorption.

In order to increase the resistance to absorption of moisture or of water I may apply a plurality of coats of the moisture resisting coating upon the edge surfaces of the wallboard. As is indicated in the above table of tests for absorption, additional coats of the moisture resisting material, such as a plasticized lacquer, materially reduce the absorption through the edge surfaces of the covering material. When such edges are formed by slitting or ordinary cutting, instead of being sanded as described above, the additional coatings may be effective to reduce the absorption to the desired degree. Preferably, however, the product of the invention is made with the sanded or ground edges and a less number of coats of the moisture resisting material may be applied to secure the desired degree of resistance to absorption.

The method of applying the lacquer to the edge surface of the covering material comprises the feature that the lacquer is of such character and of such consistency that there is avoided the forming of a solid or continuous film bridging from the edge surface of one sheet or panel to the adjacent edge surface.

The consistency of the lacquer suitable for this purpose may be such that the lacquer has a Saybolt Furol viscosity at 25° C. or 77° F. of 100 seconds to 200 seconds. This represents the time to discharge 60 cc. of the fluid lacquer of the

formula which is given above in this specification. Preferably, the desirable viscosity for the purpose of the present invention in connection with wall boards or panels of absorbent fibrous structure, as described above, is between 140 and 160 seconds viscosity. For the particular type of lacquer and consistency desirable for the purpose of the invention the Furol method utilizing a particular type of orifice is most suitable.

By the application of a plurality of coats of the moisture resisting material having a consistency thin enough to prevent this bridging, especially when the edge surfaces are ground or sanded, the desired sealing of the edges is obtained without building up on the edge surfaces a thick layer of sealing material and without substantially changing the dimensions of the sheet or panel and also without causing the sealing material to creep over upon the face of the panel. By utilizing a quick drying lacquer, of which the above formula is an example, the additional coats may be applied substantially immediately following the completion of the application of the previous coat in the systematic manner described above.

While the above tests for absorption of moisture relate to the particular fibre wallboard which has been described, the invention is not limited to the particular fibre board described and tested. It broadly relates to the sealing or coating by a suitable sizing or coating material of the edge surface of a sheet of absorbent structure, particularly a sheet of substantial thickness, such as wallboard. The range of viscosity for the sealing or coating material which has been given above, however, represents a range which will be suitable for the common fibre board materials which have absorbent structures and which are commonly used in the art. All such variations come within the scope of the invention.

Having thus described the invention I now claim:

1. Process of treating wallboard of fibrous structure formed as a rigid sheet which comprises grinding the edge surface of the sheet which is transverse to the faces thereof to provide a smooth surface, arranging a plurality of said sheets with the faces thereof in contact and the ground edge surfaces matched to afford a substantially continuous smooth composite surface composed of said edge surfaces, and applying to said composite surfaces a coating of a cellulose ester lacquer having a Saybolt Furol viscosity of 100 to 200 seconds at 77° F. to provide a consistency substantially to prevent its bridging from one sheet to the other and creeping thereof upon the faces of the boards.

2. Process of treating wallboard of fibrous structure formed as a rigid sheet which comprises grinding the edge surface of the sheet which is transverse to the faces thereof to provide a smooth surface, arranging a plurality of said sheets with the faces thereof in contact and the ground edge surfaces matched to afford a substantially continuous smooth composite surface composed of said edge surfaces, and applying to said composite surfaces a coating of a nitro-cellulose lacquer having a Saybolt Furol viscosity of 100 to 200 seconds at 77° F. to provide a consistency substantially to prevent its bridging from one sheet to the other and creeping thereof upon the faces of the boards.

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