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WALLBOARD

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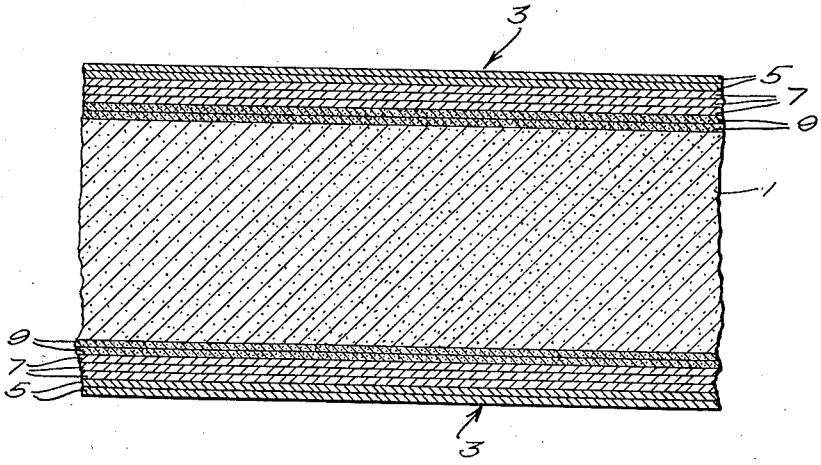

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WALLBOARD

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This invention relates to fibrous sheets and more especially to fibrous sheets made of plies in a paper-making process. The invention particularly relates to cover papers for wallboards of the type which have a core of hydraulic setting material in set condition to the face of which core the cover sheets are bonded. Gypsum wallboards and lath are of this type.

In the manufacture of wallboards of the type above referred to, and particularly in gypsum wallboards, the core material is fed between two cover papers which are continuously delivered to the board making machine. In many cases the margins of at least one of the cover papers are folded over the edge portions of the plastic mass of the gypsum mortar or slurry and the cover papers are pressed upon the core material before it is set to form the board with the desired thickness and width. In part because of the fibrous nature of the cover sheets and in part because of the inclusion, usually in the core material, of an adhesive, the cover papers become bonded to the core material. These cover papers not only provide a finish for the wallboard when one or both of them are made with a finish or decorative surface, but they also cooperate with the core as tension members to provide the desired strength in the board. It is important, therefore, that these cover papers shall be preserved undamaged. Care is exercised in handling of the materials in manufacture and the boards with finished surfaces are bundled with the finished faces together or otherwise covered to prevent injury to the cover papers in shipment and storage.

It has been found, however, in some climates, particularly in the tropics, that some insects, such as termites and those known as comejenes, will attack the paper either because of its fibre content or because of the other ingredients, such as sizing or other organic material, which are used in the manufacture of the paper.

It is an object of the invention, therefore, to produce wallboards of the type above described which will not be subject to such attack and if attacked will have a toxic effect upon the insects and thus prevent their migration throughout the cover paper structure with consequent destruction of the structural and decorative value of the board.

It has been the practice in the manufacture of many kinds of papers to incorporate sizing materials in the form of starch, silicate of soda, resins and other materials at various places in the paper-making process for the purpose of securing desired qualities in the finished paper. In some cases the sizing material is introduced in the beaters so that it is carried throughout the paper-making process and is uniformly distributed in the whole of the felted structure of the paper or in a particular ply thereof if the paper as it is made upon the paper machine is produced by felting together separate webs or plies. In other cases the sizing is incorporated in the particular ply in which it is desired to have it present by introducing the sizing at the headbox on the paper machine or at some other point which will incorporate the sizing in the particular ply but avoid its incorporation in the other plies which go to make up a plied paper. In still other cases, the sizing may be applied as a surface application to the finished paper at the calender stack or after the paper is dried and finished.

In cover papers commonly used in the manufacture of gypsum wallboard some of the plies, other than those which lie immediately adjacent or in contact with the gypsum mortar or slurry which is to form the core, have incorporated in them a sizing, for example, a rosin sizing. In practice the cover sheet may be made with a plurality of plies, for example, seven. The two plies which are at the face of the sheet opposite that which is to lie in contact with the core material of the gypsum board constitute the face liner. There may be incorporated in the felted structure of these plies a rosin sizing set with aluminum sulphate. The plies, usually two, which lie adjacent or in contact with the core material are formed without sizing. The three plies lying between the unsized plies and the face liner plies are known as the filler and may also be sized with rosin sizing set with aluminum sulphate. These filler plies, however, are of cheaper stock than the face liner plies, the latter being of a composition to provide a finished facing on the paper.

The purpose of providing the combination of sized and unsized plies, as described, is to afford in the finished cover sheet resistance to the absorption of water in the finished face of the board while at the same time insuring a condition for the plies which are in contact with the core material which will assure a good bond thereto. The sizing is so introduced into the face liner and the filler plies as to reduce absorption of water by these plies and increase the resistance to but not to prevent entirely migration towards the exposed face of the wallboard of the water from the wet mortar or slurry placed between the cover papers of the gypsum board prior to setting of the core. This water is absorbed by the unsized plies in contact with the mortar or slurry

and may assist in carrying the adhesive which is incorporated in the core material to the interface between core and cover papers and also to aid the migration of particles of the calcined gypsum to cause their interlocking with the fibres of the unsized plies of the paper upon setting.

In the treatment of cover papers, according to the present invention, it is important that these characteristics of the cover paper and the functions referred to, should not be interfered with or eliminated. Moreover, in the manufacture of gypsum board and similar materials with hydraulic setting core materials, for the most part the water contained in the mortar or slurry of the core must pass out through the cover papers upon drying. Thus the cover papers must not be impregnated or sealed to such an extent that moisture, particularly as vapor, cannot travel through them and be evaporated and eliminated at the outermost face of the face liner. Nevertheless, the sizing contained in the plies described will resist rapid migration of liquid water. Thus the migration of soluble solids contained in the water into and through these plies and upon the outer face of the board will be largely prevented. On the other hand, the absorbent plies which are in contact with the core material are in such a condition as to readily absorb water containing soluble solids, which solids upon evaporation of the water will be deposited in the felted structure of said absorbent unsized plies. Some passage of water and the solid soluble content thereof may take place into the sized plies during the relatively long time that is required for complete drying of the board so that to some extent the solids contained in the water may be deposited in such sized plies.

In order to prevent the destruction of the cover papers by the insects it is proposed, according to the invention, to incorporate in the cover papers a toxic material. The introduction of toxic materials in fibrous structures, such as insulating board, has been used heretofore. The incorporation of the toxic material in such cases is so effected as to permeate the whole structure of the insulating board so that for the most part all the fibres thereof and the structure substantially from one face to the other carry the toxic material. Such insulating boards are not of the type of, nor do they function as do the cover papers used in wallboards having a core of hydraulic setting material with which the cover papers cooperate for strength and finish in the manner above described.

In the cover papers, which are the subject of the invention, the conditions are such that the treated cover paper carries the toxic materials so that they do not appear upon the exposed face of the board or adjacent to this exposed surface. They do, however, lie in those portions of the cover paper beneath the surface, and particularly in the absorbent unsized plies adjacent to the core so that the insects, which have the habit of boring and devouring the inner or hidden portions of the fibre structure material, will encounter the toxic material and be subject to its toxic effect. Not only is it desirable to prevent the appearance upon the face of the board of the solids which may migrate to the surface of the cover paper and thus spoil the finish thereof, but it is also desirable or essential that such toxic materials shall not be carried upon the face of the board because of the irritating physiological effect of any substantial amount thereof.

The drawing illustrates to enlarged scale a section of a wallboard having a core of hydraulic setting material 1, as of calcined gypsum, with cover papers 3 at both faces thereof. Each cover paper 3 is composed of seven plies, the outer two plies 5 of which may be of sized stock providing a finished surface for the wallboard. The three plies 7 lying at the center of the cover paper 3 commonly known as the filler or centers, as above stated, if desired, also may be sized but need not be of as high quality as the liner plies. The two plies 9 which lie next to the core 1 are those which in the particular embodiment being described especially concern the invention. These plies do not carry the rosin sizing but are left absorbent for the reasons above set forth. These plies 9, however, are treated with a toxic impregnating material in the manner described.

It will be understood that the invention is not limited to the illustrated embodiment. Variations may be made in the number of plies utilized for the cover papers and also in the number of plies which are sized with rosin or other sizing material. Variation also may be made in the number of plies which are treated with the toxic material.

The invention utilizes as a toxic material one which does not interfere with the adhesion of the cover papers to the core material or elimination of the water therefrom or with other mechanical and physical characteristic requisite for such products having a hydraulic setting core between cover papers. This toxic material is preferably water soluble so that it may be absorbed by the unsized absorbent structure of the cover paper and may to some extent migrate toward and into the inner sized plies. It, moreover, is of such character as not to destroy either the fibres or the fibrous structures or the sizings carried thereby. To simplify the operations, the toxic material may be applied to the unsized side of the cover paper as the paper sheet is calendered at the calender stack of the paper making machine.

Tonic materials of the class designated as soluble chlorinated phenol derivatives may be used for the purposes of the invention. A particular example of such a material is sodium pentachlorphenate. By suitable devices this toxic material in solution, particularly in solution in water, is applied to that face of the sheet which will become bonded to the core material. In the preferred method of application of the toxic material to the cover sheet a 10% solution of the toxic material, for example, in the form of sodium pentachlorphenate, may be prepared by dissolving 25 lbs. of the sodium pentachlorphenate in 250 lbs. of warm water at a temperature of 100° to 150° F. The solution may be placed in a container and run therefrom into a water box in contact with one of the rolls of the first stack of the calender. In this way the solution maintained, at say, 100° to 150° F. may be delivered into the nip of the rolls of said stack in contact with that face of the cover sheet which is unsized and will lie in contact with the core material. Because of the absorbent nature of this ply an appreciable amount of the solution will be absorbed thereby. Tests have shown that the toxic material of this type as solid content may be absorbed by the sheet to the extent of between 18 and 28 lbs. per ton of the cover paper with which it is incorporated. This represents between .9% and 1.4% of the dry solid sodium pentachlorphenate based on the weight of the finished dry

paper. This amount of toxic material is sufficient to render the paper distasteful and toxic to the insects.

In the manner above described some migration of the toxic material into the sized plies may take place during the drying operation and while the wallboard ages. Because of the construction of the cover paper and the amount of toxic material and the concentration thereof as applied to the unsized sheet of the board, however, rapid migration or a high degree thereof into and through the sized plies is prevented so that concentration of any substantial amount of the toxic material upon the face of the board is prevented.

The toxic material selected for the purposes of the invention is such as will not interfere with the function of the unsized ply which is at that face of the paper which will contact the core material. The absorption of water by this ply and the migration of adhesive and gypsum particles or whatever resulting action takes place to secure the bond are maintained. The toxic material is of such character and is applied to the paper in such proportions that it does not fill up the structure of the ply at the core contacting face of the cover paper nor does it interfere with the usual characteristics of the cover paper as determined by tests for strength, flexibility, adhesive capacity, splitting of the plies one from the other and other tests to which the cover papers are usually subjected.

While the invention has been described above in connection with the application of the toxic material at the calender stack the toxic material suitable for the purpose and particularly a chlorinated phenol derivative, may be incorporated in the formed sheet prior to drying or at other places in the paper making process where it will be retained in the felted web. Moreover, in some cases where the wallboards, such as gypsum lath, will be used with an overlying material, such as plaster, or in such places as not to be exposed with decorative surfaces the toxic material may be incorporated not only in the ply which lies next to the core but also in other plies, for example in both outer plies of paper for gypsum lath.

Other toxic materials may be used for the purpose of the invention which will preserve the characteristics of the cover paper for its bond to the core material and will not interfere with migration of the water from the core as described above. For example, a dilute solution of mercuric chloride or sodium arsenate may be used, although for ordinary purposes they are not desirable because of their extremely poisonous nature. Inorganic salts, such as copper sulphate, zinc chloride or barium chloride may also be used although their toxic effect is not so great as that of a soluble chlorinated phenol derivative, which may be in the form of the pentachlorphenates of the alkaline metals. Because of its cheapness and availability sodium pentachlorphenate is preferred.

In the ordinary practice of sizing of the sized plies with rosin it is customary to use alum, aluminum sulphate, to precipitate the rosin from an alkaline suspension in water. Normally an excess of alum is necessary and the excess remains in the sized plies. Migration of the toxic material to the inner sized plies and, as well, absorption of the alum by the unsized plies as the web is formed brings the toxic material in contact with the alum. The sodium pentachlorphenate, normally of alkaline character or requiring alkalinity for its solution in water, is converted by reaction with the acid alum to the insoluble pentachlorphenol which therefore becomes permanently fixed in the paper.

Having thus described my invention, I now claim:

1. A wallboard comprising a core of hydraulic setting material in set condition between cover sheets of felted fibrous material, and a toxic substance carried by said fibrous sheets at the portions thereof removed from that face of the sheet which is exposed in the board.

2. A wallboard comprising a core of hydraulic setting material in set condition between cover sheets of felted fibrous material, said cover sheets consisting of a plurality of plies of felted fibres, one of said plies carrying a sizing material resisting passage of liquid through said ply by capillary action, and a toxic substance carried by a ply of said fibrous sheets which lies between said sized ply and said core.

3. A wallboard comprising a core of calcined gypsum in set condition, and a cover paper bonded to said calcined gypsum core said cover paper comprising a plurality of plies of felted fibres felted together to form said cover paper, and a toxic substance carried by at least the ply of said cover paper which is in contact with said core.

4. A wallboard comprising a core of calcined gypsum in set condition, and a cover paper bonded to said calcined gypsum core, said cover paper comprising a plurality of plies of felted fibres felted together to form said cover paper, the outermost of said plies being of such composition and finish as to provide on said wallboard a finished face, and a toxic substance carried by at least the ply of said cover paper which is in contact with said core but not extending in said cover paper to the finished face of said outermost ply.

5. A wallboard according to claim 1 in which said toxic substance is sodium pentachlorphenate.

6. A wallboard comprising a core of hydraulic setting material in set condition between cover sheets of felted fibrous material, said cover sheets consisting of a plurality of plies of felted fibres, one of said plies removed from said core having incorporated therein a sizing material resisting the passage of liquid through said ply by capillary action, the ply in contact with said core being unsized and having a toxic substance incorporated therein.

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