Dec. 7, 1943. G. A. HOGGATT 2,336,251

WALL BOARD

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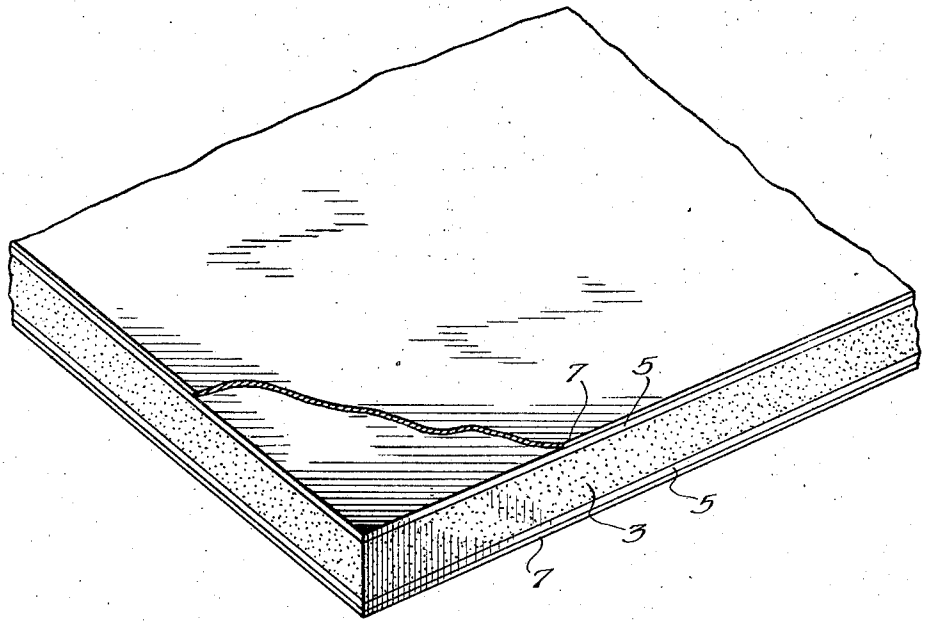

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WALLBOARD

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This invention relates to wallboards or panels, especially those having a core of hydraulic-setting cementitious material. The invention particularly relates to gypsum wallboards in which a core of calcined gypsum in set condition lies between cover papers adhering thereto.

Wallboards and panels having a core of hydraulic-setting cementitious material have been made in many forms. A common form is that made of calcined gypsum which has been prepared as a mortar or slurry and placed between cover sheets of paper of suitable strength, thickness and other characteristics which cause the paper to adhere to the core when set and to provide a facing for said core. An important function of said cover papers is that, being located at the faces of the core, they are able to take the stress applied to the wallboard which causes tension at these faces. The core itself, particularly with gypsum wallboards, is usually frangible. The cover papers afford the necessary resistance about a neutral axis within the core thus to resist deformation and breakage of the panel. The strength thus given to the panel is considerable so that wallboards of this type are used to span across the spaces between studs and ceiling beams when fastened thereto by ordinary fasteners such as nails. These fasteners are driven through the cover papers and the core to enter the studs or beams. The cover papers likewise serve as a reinforcement around the core at the points where the nails are driven therethrough.

The cover papers upon the frangible core, however, have a certain resilience and stretch. They are not capable of resisting compressive strains. The core material alone, particularly of calcined gypsum, is not capable of resisting without fracture any substantial deformation under forces causing bending of the panel. A certain amount of bending of the panel formed with cover papers, however, may take place before fracture of the board as a whole within the elastic limit of the cover paper. It is apparent, therefore, that reliance for rigidity and resistance to fracture in present types of wallboards is placed wholly or in large part upon the strength of the cover papers with the result that the board is more flexible than is desirable and must be handled with care to avoid breakage and to avoid damage caused by crushing of the core.

It is an object of the invention to provide a wallboard having such a core of hydraulic-setting material which is more rigid than the usual wallboards of this type.

It is a further object of the invention to provide a wallboard having an hydraulic-setting core, particularly one with a core of calcined gypsum, which will have greater resistance to crushing under a blow upon the face of the panel and under stress which may be brought upon the panel after erection because of the expansion and contraction and settlement and other causes.

A particular object of the invention is to provide a core of such construction that it will cooperate with the cover papers to provide greater rigidity and strength in the panel and greater resistance to damage without substantial increase in the weight of the materials usually used and without substantial increase in the finished weight of the panel.

The drawing illustrates a portion of a wallboard embodying the invention.

It has been proposed heretofore to provide in the core of a gypsum wallboard a portion at its center which is of less density than a layer of gypsum which is next to the cover paper. By maintaining adjacent the cover paper a layer of the gypsum of the usual composition while making the inner portion of light weight a wallboard of lighter weight but of no greater strength than ordinary wallboard was secured.

In the present invention the core material is made in any known manner and may be of light weight as proposed in the prior art or of ordinary density and strength as in common practice. Such core materials when made with calcined gypsum, for example, ordinarily have the characteristic that to secure a pouring consistency in the slurry to be applied between the cover papers 60 to 80 parts of water for each 100 parts of the dry cementitious material are required. Such an amount of water itself produces a core which is more or less porous, that is not dense, because of the voids which are left upon evaporation of the water. When, as has been suggested in the prior art, gas or bubble forming materials are incorporated to increase the porosity of the hydraulic-setting material a core of still less density is secured. In all such cores, however, this decrease in density and, therefore, weight of the finished panel is obtained at the expense of strength.

In the product of the present invention the inner portion of the core may be made of any suitable composition but between said core and one or both cover papers is placed a layer or layers of an hydraulic-setting material of such composition as to secure an increased density

in said layers as compared with core materials which have been used heretofore. In order to secure this greater density, hydraulic-setting materials having inherent characteristics as to the crystalline structure thereof may be used; also those which are of such composition as to require little water to secure the necessary pouring consistency are used. Hydraulic-setting materials of either type for pouring consistency may require water to the extent only of 30 to 50 parts of water for each one hundred parts of the hydraulic-setting material in the dry state by weight.

A material in which the low water-carrying capacity for pouring consistency is obtained by virtue of its crystalline structure is disclosed in the patent to Wilbur S. Randel and Manvel C. Dailey, No. 1,901,051, of March 14, 1933. In said patent is described a process of calcining gypsum rock under controlled conditions of pressure, time and temperature which insure high tensile and compressive strengths in the casts made from the calcined gypsum. The patent describes the product as a new type of calcium sulphate hemihydrate which is substantially entirely monomineralic and consists solely of crystal fragments consisting of pure calcium sulphate hemihydrate requiring a great deal less water to convert them into a cementitious slurry of normal pouring consistency as compared with the prior art products.

A material having the requisite properties by virtue of its composition is disclosed in the patent to Harry F. Gardner, No. 1,996,372 of April 2, 1935. In this latter patent the low water-carrying capacity is obtained by the admixture with calcined gypsum of a saccharide, such as gum arabic, and an alkaline material, such as lime. The alkaline materials disclosed in the patent in general are the alkalies, including ammonia, the alkaline carbonates and borates, as well as the organic alkali hexamethylenamine. In some formulae of the Gardner patent a lead compound, such as litharge, may be included, particularly when litharge and soda ash are used together with gum arabic in the composition. In the patent also the advantage of using calcined gypsum which has been tube milled is explained. The patent also discloses certain specific compositions to secure optimum results in such a high density hydraulic-setting material. Examples of such compositions as are proposed by the patent are given therein and ranges of the percent of the effective ingredients of the composition. Thus the amount of the saccharide, such as gum arabic, may vary from .4% to 10% and of the alkaline material from .01% to 2%. The amount of the lead compound, such as litharge, may vary from .5% to 10%. In general the amount of the calcined gypsum of the composition plaster will be predominant and in most cases not substantially less than 75%. Other details of the method of the preparation of the plaster and of its composition may be learned from the patent.

Within the scope of the invention, however, any hydraulic-setting material, particularly any calcined gypsum, which has been prepared so as to have the property of not requiring substantially in excess of 45 parts of water for each 100 parts of the dry material in order to secure pouring consistency may be used. Instead of or in addition to the gum arabic of the composition of the Gardner Patent No. 1,996,372, other vegetable materials which will act as adhesives may be used to improve the bond of the cover paper to the interposed dense layer.

In the drawing the core of the wallboard of ordinary density and strength is shown at 3. Between said core and the cover papers 7 at each face of the wallboard the layer 5 is interposed. These layers according to the invention are formed of the hydraulic setting material of low water carrying capacity and may be provided by calcined gypsum of the type described in said patent to Randel and Dailey or of the type described in said patent to Gardner.

When such an hydraulic-setting material is used as the layer intervening or lying between the usual core material and the cover papers the desired results of rigidity, strength, resistance to crushing and an improved backing for the cover paper are secured. The materials which have been proposed for the interposed layer are capable, as with the ordinary core materials, of affording the necessary bond of the cover papers to the core material, that is, to the layer. The materials for the layer also are capable of setting either in contact with the dry set core material or preferably while both the core material and the material of the interposed layers are in the process of setting to secure the necessary bond between the layers and the core material. Thus, adjacent the surface of the core the invention provides a stiffening element capable of resisting greater stress of compression applied thereto and in many cases greater stress of tension. Strains tending to cause deformation and breakage are thus resisted. This element, that is, the layer capable of taking increased compression, acts with the tension member in the form of the cover paper so that strains resulting from stresses of tension or compression are satisfactorily resisted.

Having thus described my invention I now claim:

1. A composition wallboard comprising a cover sheet of fibrous structure, a base core of hydraulic setting cementitious material in set condition, and a layer of hydraulic setting cementitious material in set condition requiring for pouring consistency not substantially greater than 50 parts of water to 100 parts of said material in dry condition and securing in said set layer a greater density and strength than that of the base core, said layer lying between and adhering to said cover sheet and to said base core.

2. A gypsum wallboard comprising a paper cover sheet, a base core in set condition of calcined gypsum requiring for pouring consistency not substantially less than 60 parts of water to 100 parts of the dry calcined gypsum, and a layer in set condition of hydraulic setting material comprising calcined gypsum and requiring for pouring consistency not substantially greater than 50 parts of water to 100 parts of the dry hydraulic setting material, said layer in set condition lying between and adhering to said paper cover sheet and to said base core.

3. A gypsum wallboard comprising a paper cover sheet, a base core in set condition of calcined gypsum requiring for pouring consistency not substantially less than 60 parts of water to 100 parts of the dry calcined gypsum, and a layer in set condition of hydraulic setting material comprising calcined gypsum in amount not substantially less than 75%, a saccharide, and an alkaline material selected from the group consisting of the alkalies, the alkaline carbonates, and the alkaline borates, the amount of the alka-

line material being not substantially greater than that of the saccharide, said percentage being based upon the weight of said three ingredients of said layer as a dry mixture, said layer in set condition lying between and adhering to said paper cover sheet and said base core.

4. A gypsum wallboard comprising a paper cover sheet, a base core in set condition of calcined gypsum requiring for pouring consistency not substantially less than 60 parts of water to 100 parts of the dry calcined gysum, and a layer in set condition of hydraulic setting material comprising calcined gypsum in amount not substantially less than 75%, a saccharide, a lead compound, and an alkaline material, the amount of the alkaline material being not substantially greater than that of the saccharide, said percentage being based on the sum of the weights of said four ingredients of said layer as a dry mixture, said layer in set condition lying between and adhereing to said paper cover sheet and to said base core.

5. A gypsum wallboard comprising a paper cover sheet, a base core in set condition of calcined gypsum requiring for pouring consistency not substantially less than 60 parts of water to 100 parts of the dry calcined gypsum, and a layer in set condition of hydraulic setting material comprising calcined gypsum, gum arabic, and an alkaline material, the percentage of calcined gypsum in said layer being not substantially less than 75% based on the sum of the weights of said three ingredients of said layer as a dry mixture, the percentage of the gum arabic being not substantially less than that of the alkaline material, said layer in set condition lying between and adhering to said paper cover sheet and to said base core.

6. A gypsum wallboard comprising a paper cover sheet, a base core in set condition of calcined gypsum requiring for pouring consistency not substantially less than 60 parts of water to 100 parts of the dry calcined gypsum, and a layer in set condition of hydraulic setting material comprising calcined gypsum in amount not substantially less than 75%, gum arabic in amount between .4% and 10%, an alkaline material in amount between .01% and 2%, said percentages being based on the sum of the weights of said three ingredients as a dry mixture, said layer lying between and adhering to said paper cover sheet and to said base core.

7. A gypsum wallboard comprising a paper cover sheet, a base core in set condition of calcined gypsum requiring for pouring consistency not substantially less than 60 parts of water to 100 parts of the dry calcined gypsum, and a layer in set condition of hydraulic setting material comprising calcined gypsum in amount not substantially less than 75%, gum arabic in amount between .5% and 10%, litharge in amount between .5% and 10%, and an alkaline material in amount between .01% and 2%, said percentages being based on the sum of the amounts by weight of said four ingredients of said layer as a dry mixture, said layer in set condition lying between and adhering to said paper cover sheet and to said base core.

8. A gypsum wallboard comprising a paper cover sheet, a base core in set condition of calcined gypsum requiring for pouring consistency not substantially less than 60 parts of water to 100 parts of the dry calcined gypsum, and a layer in set condition of hydraulic setting material comprising substantially pure crystalline finely ground calcium sulphate hemihydrate requiring to produce pouring consistency the addition of not substantially more than 50 parts of water to 100 parts of said hydraulic setting material in dry condition, said layer in set condition lying between and adhering to said paper cover sheet and said base core.

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