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A. ELMENDORF
CEMENT-FIBER BOARD
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Fig. 1.

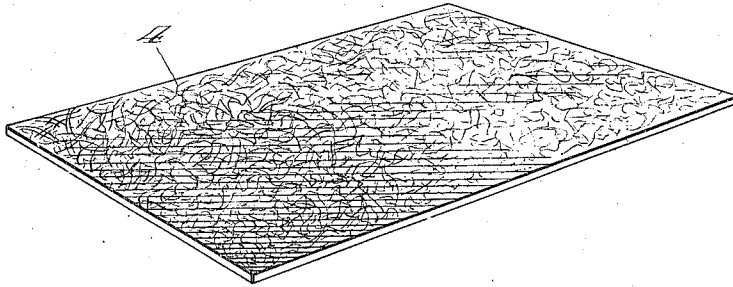


Fig. 2.

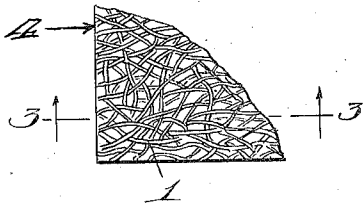


Fig. 3.

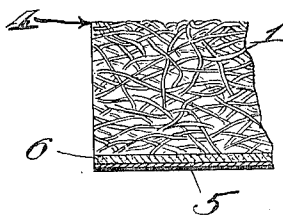
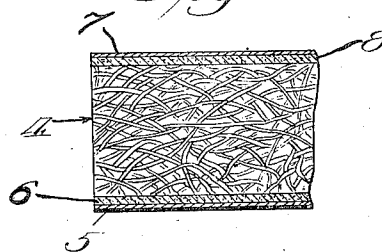


Fig. 4.



Fig. 5.



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CEMENT-FIBER BOARD

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11 Claims. (Cl. 154—45.9)

Material in the form of thick boards and blocks has heretofore been produced from fibers and cement in such a manner as to leave many cavities or air spaces within the structure. In order to provide the necessary strength, commercial products of this kind range in thickness from one inch to three inches. The field of use of panels or boards of such thicknesses is, of course, greatly restricted, due both to their great thickness and to their great weight. The object of the present invention is to produce a board or panel of this general type which is light and thin and yet of sufficient strength to permit it successfully to be used for facing walls or ceilings, as a plaster base, and as a sound-absorbing material, in competition with other materials employed for these same purposes.

In accordance with my invention, I use fibers that are fine or thread-like instead of coarse, as is the case with ordinary excelsior. This enables me, in the first instance, to secure what may be regarded as a more finely grained product. One side of each panel is reinforced with a sheet of strong, tough, flexible material, preferably kraft paper, bonded or united to the panel by a layer of cement. Inorganic cements, in general, and preferably hydraulic cements, are suitable for my purpose. When the paper and the porous body are bonded together by a layer of inorganic cement, the panel remains flat whereas, if the bonding material be organic, it warps badly. The body of a panel, so made, is of a skeleton-like structure full of interconnected large pores or cavities. Therefore, although the paper and the cement reinforcing on one face seal the pores or cavities on one side of the panel, the pores on the opposite side remain open. When a panel is placed against a wall in the interior of a building, with the backing next to the wall, the backing best serves its intended purpose of providing tensile strength to resist bending of the panel under thrusts against the exposed face. At the same time, the exposed side or face is best adapted to serve its intended purpose of breaking up sound waves, of providing a good support for plaster directly applied thereto, or of affording an attractive decorative effect. The sound-absorbing capacity of the material may be fully retained whether the material be left in a raw state or be decorated through painting the same. Where a combined sound absorbing and decorative coloring characteristic is desired, the paint need only be sprayed on in order to avoid clogging of the pores.

Another advantage in using inorganic cement

to bind the paper to the porous body is that if the paper lies upon a smooth, flat surface during the making of a panel, the paper-faced side of the panel will not only be flat but smooth and free from depressions. This is due to the fact that the cement fills the pores in the under face of the porous mass and sets in the form of a hard layer whose under surface takes on the smoothness of the flat supporting surface. Therefore, the paper-coated face of the panel may be exposed in situations where a smooth, flat surface is desired. When an organic binder is used, on the other hand, the paper facing contains pits and presents a rough appearance because it shows the fibrous nature of the underlying structure.

While vegetable fibers of other kinds may be employed, I prefer wood fiber. Some wood fibers may be coated directly with the cement. In order further to increase the strength of the board or panel, the fibers may be given a preliminary treatment to provide them with a coating of calcium silicate.

The cement sets promptly on fibers of cottonwood, poplar, aspen, white pine, and ponderosa pine, among others, without such preliminary treatment. Other woods as, for example, redwood and oak, do not cooperate satisfactorily, in their natural states, with the cement which does not set properly on them in their natural states. I have discovered that if the fibers of such woods are boiled and then washed until their water-soluble elements are leached therefrom, they may be handled in just the same way as are those of woods that require no preliminary treatment.

In the manufacture of panels, thread-like wood fibers, say, about one-fiftieth of an inch in transverse dimensions, and preferably not over an inch or two long, are dampened. The cement, which may be ordinary Portland cement, is dusted over the mass of wet fibers. The mass is then run through a shredder which thoroughly agitates and mixes the fibers and delivers them in what may be termed a fluffy condition. Backing sheets of the proper size of the panels desired having been prepared, these are moistened, both for the purpose of insuring that they will lie flat, and for the further purpose of protecting cement that comes in contact therewith from having too much water withdrawn therefrom by absorption in the backing material. A thin layer of cement, in a plastic state, is then spread over each backing sheet. The backing sheet may in the first instance have been placed in the bottom of a

mold or form, or the mold or form may be placed about the same after the coating or layer of cement has been applied. The proper quantity of shredded or fibrous material in which the individual fibers carry moist cement coatings is then deposited in the form or mold associated with each backing sheet and is distributed to give a uniform thickness or depth throughout the entire area of the form or mold. A suitable platen or presser member is then brought down upon the fibrous mass which is squeezed until the fibrous material has been reduced to a layer of the desired thickness. The pressure on the work is maintained until the cement has taken an initial set, whereupon the slabs or panels are removed from the forms or molds and are stacked up so that the moisture will be retained within the same while the curing of the cement proceeds. After standing thus for several days, the slabs or panels are placed in a drier from which they emerge ready for use.

For coating the fibers, I use from two to three parts, by weight, of dry cement to one part, by weight, of dry wood fiber. For each one thousand square feet of panel, three-eighths of an inch thick, I use from nine hundred to twelve hundred pounds of wood fiber and cement, those being the weights of the dry materials. For a panel one-half inch thick, from thirteen hundred to seventeen hundred pounds of the mixture are generally used.

The backing may be any suitable, strong, tough, flexible material, although usually a kraft paper may be advantageously employed. The cement layer or coating for the backing sheet is of a thickness that results from the application of a slush containing from about one hundred pounds to three hundred pounds of cement for each one thousand square feet of the sheet backing material. If the backing material is a kraft paper having a thickness of about ten one-thousandths of an inch, the cement coating should be about twice as thick as the paper, although that factor is variable.

Panels may, of course, be manufactured in various sizes. What may be termed a popular size is a panel twenty and one-quarter inches wide and sixty-four inches long.

Some of the desirable characteristics of my improved panels are: although unbalanced in construction, they do not warp; they do not shrink or expand in drying or wetting; they will not support combustion; they will not crack and can be nailed and sawed; they have great strength, considering their lightness; they have good sound-absorbing capacity; they may be painted for decorative effects and, if the painting is done by spraying, their sound-absorbing properties are not diminished; and they may advantageously be employed as a plaster base, since plaster keys itself thereto exceedingly well.

In the accompanying drawing, 1 is a perspective view of a panel embodying the present invention; Fig. 2 is an elevational view of the face of the panel showing, on a much larger scale than Fig. 1, a fragment of one corner of the panel; Fig. 3 is a section, on a magnified scale, on line 3-3 of Fig. 2; Fig. 4 is a perspective view, on a still larger scale, of a fragment of one of the coated fibers; and Fig. 5 is a view similar to Fig. 3, showing a modification.

Referring to the drawing, 1 represents a cement coated thread-like strand comprising a thread-like element 2 of wood, although other vegetable fiber may be employed; the element 2

being coated with inorganic cement 3. 4 is a thin slab composed of fibers or strands 1 disposed haphazardly and united into a rigid, porous structure by their cement coatings. 5 is a backing sheet, for which tough kraft paper is suitable. Overlying the backing sheet and securely bonded thereto is a thin layer 6 of inorganic cement which is integrated with the slab-like porous body member.

In the process of manufacturing the panel, as heretofore described, the fluffed mass of fibers, haphazardly disposed, is compressed, while overlying the coated backing sheet, to a small fraction of its original thickness, while the cement coating on the backing and the coating on the fibers are still wet, so that when the cement sets, the panel becomes a hard, rigid body full of pores or cavities, those adjacent to one face of the panel opening out through that face, while those on the opposite side of the panel are sealed by the cement layer 6 and the backing sheet 5. The backing sheet and the cement layer or coating thereon form the only imperforate part of the structure extending across the entire length and width of the panel, and therefore constitute an effective tension member for the panel when the latter is in its normal position of final use.

It is, of course, evident that should one desire to do so, boards or panels may be faced with paper on both sides. In that case, a layer of cement may be applied over the board or panel before it is removed from the mold or form, a sheet of paper be laid on the cement and pressure be exerted through a flat top plate. Such a structure is shown in Fig. 5, wherein the panel of Fig. 3 is shown as having on the upper side added layers 7 and 8 corresponding to the layers 5 and 6 on the bottom.

It will of course be understood that although the paper faced panels constitute the most highly developed form of my invention, the paper facing or facings may be omitted and still leave the panel with novel and valuable properties, namely, flatness and smoothness and hardness of surface. Also, in the case of a panel such as shown in Fig. 5, the paper facing may be retained on the tension side of the panel and be omitted on the compression side.

While I have illustrated and described with particularity only a few physical embodiments of my invention, I do not desire to be limited to the exact structural details thus illustrated and described, nor to the exact details of the method disclosed; but intend to cover all forms and methods coming within the definitions of my invention constituting the appended claims.

I claim:

1. A panel for structural purposes comprising a paper backing, a layer of inorganic cement forming a coating on one side of the backing and a mass of cement-coated haphazardly-disposed fibers united by their coatings into a skeleton-like, porous structure permanently united to said coating.

2. A panel for structural purposes comprising a paper backing, a layer of inorganic cement forming a coating over one face of said backing, and a thin, rigid slab, composed of cement-coated vegetable fibers loosely matted and held together by their coatings, integrally united with said coating; the cement layer being sufficiently thick to hold the panel flat against the pull of the paper backing, upon drying.

3. A panel for structural purposes having a thickness of one-half inch or less comprising a

thin, flexible backing sheet, a coating of inorganic cement bonded to the backing sheet, and a porous slab composed of matted fibers coated with and united to each other by inorganic cement, said slab and said coating being permanently united; the said coating of cement being about twice as thick as the backing sheet.

4. A panel for structural purposes comprising a flexible backing sheet, a layer of inorganic cement forming a coating on one side of the backing sheet, and a mass of cement-coated haphazardly-disposed wood fibers having a width in the neighborhood of one fiftieth of an inch united by their coatings into a skeleton-like porous structure permanently joined to the coating on the backing sheet.

5. A panel for structural purposes comprising a flexible backing in the form of kraft paper about one-hundredth of an inch thick or the like, a layer of inorganic cement about one-fiftieth of an inch thick forming a coating over one face of said backing, and a thin, rigid slab, composed of cement-coated wood fibers having widths of about one-fiftieth of an inch loosely matted and held together by their coatings, integrally united with said coating on the backing.

6. A panel for structural purposes having a thickness of one-half inch or less comprising a flexible backing sheet of kraft paper or the like, a layer of inorganic cement about one-fiftieth of an inch thick forming a coating on the backing sheet, and a porous slab composed of thread-like wood fibers coated with and united to each other by inorganic cement, said slab and said coating on the backing sheet being integrally united.

7. A panel for structural purposes comprising a skeleton-like porous slab formed of haphazardly-disposed vegetable fibers coated with and held together by inorganic cement, and a

continuous layer of inorganic cement extending over at least one of the faces of the slab.

8. A panel for structural purposes comprising a thin skeleton-like porous slab formed of haphazardly-disposed vegetable fibers coated with and held together by inorganic cement, and a thin hard layer of inorganic cement extending over a face of and a short distance into the pores of the slab and providing the slab with a smooth surface.

9. A panel for structural purposes comprising a thin skeleton-like porous slab formed of haphazardly-disposed vegetable fibers coated with and held together by inorganic cement, and a thin hard layer of inorganic cement extending over each face of and a short distance into the pores of the slab and providing the slab with smooth surfaces.

10. A panel for structural purposes comprising a skeleton-like porous slab formed of haphazardly-disposed vegetable fibers coated with inorganic cement and held together by their coatings, the weight of the aforesaid cement being greater than that of the vegetable fibers, when both are dry, and a continuous layer of inorganic cement extending over at least one of the faces of the slab and penetrating a short distance into the interior of the slab at that face.

11. A panel for structural purposes comprising a skeleton-like porous slab formed of haphazardly-disposed vegetable fibers coated with an inorganic cement which, in a dry state, has a weight at least twice as great as the weight of the dry vegetable fibers, said fibers being held to each other by their coatings, and a continuous layer of inorganic cement extending over at least one face of the slab.

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