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COMPLETE SPECIFICATION

Improved Building Board

I, JULIUS WILLIAM ELISCHER, of 28 Kingsway, Nedlands, in the State of Western Australia, Commonwealth of Australia, Australian Citizen, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THIS INVENTION relates to an improved building board and particularly to an improved building board which is self-supporting and has load-bearing properties and further which can be used in the construction of a non-modular flush wall or ceiling.

In most technically advanced countries, a few decades ago, walls consisted of solid brick, or stud walls lined on both sides with suitable sheets. The introduction of reinforced concrete construction on the one hand, and on the other the need for saving on on-site labour, has produced a wide range of new wall constructions. However, no wall panels have yet been developed which are relatively light, but have substantial strength without additional frame construction, and which can be joined with the minimum of site labour into a non-modular flush wall construction. The basic problem with a non-modular flush wall construction is that the material used must be practically dimensionally inert after manufacture. The only cheap material in the building trade which has this characteristic is plaster. This has led to the manufacture of complete floor to ceiling plaster wall slabs. However, these slabs, because of the fragile nature of the plaster material, have proved in practice to have imperfect joints, susceptible to developing cracks which are hard to fix. All the known types of board have some weaknesses. Walls constructed of reinforced concrete, concrete blocks, plaster blocks or thick wood-wool cement slabs have also been used and are

relatively cheap. However they do not result in any substantial reduction of the on-site labour nor are they suitable for prefabricated plumbing and/or electrical wiring. Some reduction in on-site labour requirements can be achieved with what are known as removable partitions consisting of chip board or plastic foam lined on both faces with asbestos sheeting, plywood or laminated plastic sheeting and supported in a wooden or metal frame. Such partitions are usually expensive and are of a modular nature with all the advantages and disadvantages of such systems.

It is an object of this invention to provide a building board which is self-supporting or load-bearing, and is economical to manufacture and erect.

The invention resides in a prefabricated, self-supporting, load-bearing building board consisting of a central core of a foraminous material having resistance to shear loads, an intermediate plaster layer of high compressive strength firmly bonded to both faces of the central core by penetration into the interstitial spaces in the central core and an outer layer of paper or card of high tensile strength bonded to each intermediate layer, each of said paper layers being pretensioned by being applied to said plaster layers whilst the plaster layers are still wet.

The central core may be woodwool cement or other foraminous materials such as expanded polystyrene or polyurethane foam may be used. Other suitable foam-like materials include foamed plaster, foamed concrete and vermiculite plaster. The foraminous material from which the central core is formed should have sufficient strength to resist shear and to hold the intermediate plaster layer as well as the other required properties such as thermal insulation, light weight and fire resistance.

[Price 4s. 6d.]

Price 5s 0d.

The materials specified above have these properties to some degree.

5 The type of bond required between the various layers of the board should be such that the material of one or more of the layers should rupture before the bond at the interface between the layers ruptures. Thus when the plaster is applied as the intermediate layer to both faces of a central core
10 formed from woodwool cement the plaster penetrates into the interstitial spaces in the woodwool cement thus forming a firm bond between the woodwool cement and plaster. Likewise, when paper is applied to wet plaster there is a firm bond between the plaster
15 and the paper when the plaster dries.

In another form the invention resides in a method of producing a building board which comprises feeding a slab of foraminous material between rollers, applying a slurry of plaster to both surfaces of the slab so that the plaster flows into the surface or outside cavities in the slab and becomes firmly bonded thereto, applying an outer layer of paper or card having a high tensile strength to the wet slurry on both surfaces of the slab and allowing or causing the intermediate and outer layers to dry.

30 In one specific embodiment of the invention, there is provided a building board for use in the erection of partitions or load-bearing walls having a core manufactured by known methods, of woodwool cement, which consists basically of wood shavings bonded together with portland cement, plaster of paris or magnesium oxychloride. To achieve the necessary bond, the wood fibre is pretreated with chemicals such as sodium silicate, calcium chloride or the like.

40 The core is manufactured in slabs of desired dimensions and may be from one inch to three or four inches thick. Grooves are provided along two longitudinal edges of the slabs to enable the slabs to be joined in edge-to-edge relation with known tongue-and-groove joining arrangements.

45 A layer of plaster material is applied, in a wet condition to both surfaces of each slab and surface imperfections or cavities, which are normally formed in the woodwool cement slabs, are filled with the plaster material so that the plaster layers become integrally bonded to the slab.

50 The plaster layers are applied as even, smooth layers, and while the plaster material is still wet, an outer layer of a heavy paper or card, is applied to the surface of each layer in the wet state and bonds strongly to the plaster layer so that, when dry, it forms a prestretched layer which has a high tensile strength.

60 The surface of the building board adjacent to the longitudinal edges thereof is recessed to accommodate a jointing strip when two boards are to be flush jointed so that a smooth,

unbroken surface results. The jointing strip may consist of reinforcing gauze bedded in plaster or a paper strip similar to the general surfacing material of the board fixed in position with a suitable adhesive.

70 A board having the specific features described above is shown in the accompanying drawing which is a fragmentary section through two boards joined together. The woodwool core 1 of each board is provided on each surface with a plaster layer 3 to which is bonded a paper layer 4. The two boards are joined together by a bridging piece 2 accommodated in aligned longitudinal grooves 6 formed in the longitudinal edges of each board. As described above the surface of each board adjacent the longitudinal edges is recessed to accommodate a jointing strip 5.

85 A finished board may be manufactured to any desired dimensions to provide a load-bearing building board, a self-supporting partition or a ceiling slab.

In the preferred method of manufacturing the building board according to the invention, a woodwool cement slab having grooved edges is supported by rollers engaging in its grooved edges and plaster applied to both faces of the slab so that the thickness is the same on both sides, and the paper lining material is applied simultaneously to the plaster material.

90 It will be appreciated that board made according to the invention enables complete walls or partitions to be erected quickly and cheaply and without any imperfections or lines which other types of building boards produce. The recesses in the longitudinal surface edges of the board of this invention which facilitate flush jointing of the board are of a depth such that a jointing strip, when affixed across the join between abutting board sections, is perfectly flush with the surface of the board sections.

105 It will also be noted that the thickness of the plaster layers may be as desired for particular application. For a typical wall board, however, of say about 2 1/4" thick, the core would be approximately 2" thick, the plaster layers approximately 3/32" thick and the paper lining would be approximately 1/32" thick.

110 The economies of the new plaster board can be appreciated when it is realised that paper faced plaster board which is normally fixed to both sides of a stud wall is recognised as the cheapest type of flush wall construction in most countries and at least this is the case in Australia, the United Kingdom, Germany and the United States of America. Whilst such a wall is lined with two paper faced plaster boards and thus contains four layers of paper and two thicknesses of plaster, the board of the present invention consists of only two layers of paper and two layers of
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5 plaster of slightly less thickness than in the plaster board. If it is assumed that the costs involved in producing the board of the present invention is identical to the costs involved in producing two paper faced plaster boards (in fact, it is less) the board of the present invention would still have a cost advantage because it required less materials (in most countries woodwool cement slabs cost less than the equivalent area of stud wall construction). To this advantage must be added the fact that the erection of the boards of the present invention and the flush jointing thereof involves less labour than the erection and flush joining of plaster boards on a stud wall.

10 The board of the present invention has dimensional stability and can be manufactured to close tolerances. This is believed to be due to the intermediate plaster layers which do not expand or contract to any significant extent after the manufacture of the board. This reduces the amount of on-site labour for the erection of the board and also enables prefabricated plumbing and/or electrical installations to be incorporated in the boards where required.

15 The advantages of using paper as the outer layer can be stated as follows:—

20 Firstly, when the paper is applied it becomes wet, and when it dries it becomes a prestretched surface. Secondly, the paper surface is a considerably truer surface than can be achieved with plaster alone, and a surface which is very good as a base for painting. Thirdly, the paper has a big advantage in eliminating scuffing, transport and handling damage which is a big problem with reinforced plaster partitions which have no paper surface. These plaster boards are very often cracked, and because of the nature of plaster, these hairline cracks (and also the joints) always reappear again and again.

25 At this moment, there are on the market all over the world plaster slabs which are self-supporting, and to some extent load-bearing. Many of these have hollow cores or, in some cases, a vermiculite plaster or foamed plaster core, and the outside surfaces are solid plaster, in some cases containing some type of reinforcement, mostly hemp. This reinforcement is usually limited in its effectiveness, because firstly it is not a reinforcement of great strength, and secondly it is not in a prestretched position in the board, and being further inside the surface of the board its effectiveness is also reduced.

30 A further advantage of using paper as the outer layer is that the joints can be made flush by providing adjacent each edge of the panel a slight recess into which a strip of paper is placed with a suitable adhesive to bridge the joint between adjacent panels. After painting the joint is not normally visible.

35 The board of the present invention is

superior to the boards produced from plastic foam cores lined on each side with asbestos cement sheets, laminated plastic sheets or plywood hereinafter referred to as plastic foam boards for convenience. In the board of the present invention materials which in themselves are cheap basic materials are used and which would be normally difficult to handle and fix alone whereas the components of plastic foam boards such as the asbestos cement sheet can be easily handled and fixed. A plastic foam board has only the characteristics of the materials of which it is composed whereas the board of the present invention has characteristics which are vastly superior than any of the characteristics of the individual materials of which it is composed. Plastic foam boards do not have a high fire rating nor can they be used to produce a flush wall. Also they must always be used in conjunction with some type of frame because of their lack of dimensional stability.

70 The results of some tests conducted by the Department of Civil Engineering, University of Western Australia, are set out below and serve to illustrate the effectiveness of the present invention:

Test No. 1—Flexure Test on 5' 10" span centrally loaded

- (a) Expanded polystyrene core material alone without intermediate plaster layer or outer paper layer. Dimensions of board tested—6'×2'×1". No resistance full deflection under own weight. 95
- (b) Woodwool/cement core alone without intermediate plaster layer or outer paper layer. Dimensions of board tested—6'×2'×1". Failure occurred at a load of 70 lb. and a deflection of 3½". 100
- (c) Ceiling board comprising woodwool/cement core with intermediate plaster layer and 78 lb. paper layer on each face. Dimension of board tested—6'×2'×1½". Failure occurred at a load of 270 lb. and a deflection of 2½". 105
- (d) Ceiling board comprising expanded polystyrene core with ½" intermediate plaster layer and 78 lb. paper layer on each face. Dimensions of board tested—6'×2'×1½". First crack occurred at a load of 120 lb. and a deflection of ¼". Failure occurred at a load of 185 lb. and a deflection of 1¼". 110

Test No. 2—Column Tests on 8 feet height

- (a) Wall board consisting of expanded polystyrene core 1½" thick with an intermediate plaster layer ¼" thick and 78 lb. paper layer on each face. Di- 125

mensions of board tested—8'×2'×2". Failure occurred by crushing at a load of 5600 lb.

- 5 (b) Wall board consisting of woodwool/cement core with an intermediate plaster layer and outer paper layer on each face. Dimensions of board tested—8'×2'×2". Failure occurred at a load of 6270 lb.

10 (NOTE—The board tested had a slight bow and it is believed that a straight board would have withstood a substantially higher load before failure).

WHAT I CLAIM IS:—

- 15 (1) A prefabricated, self-supporting, load-bearing building board consisting of a central core of a foraminous material having resistance to shear loads, an intermediate plaster layer of high compressive strength firmly
20 bonded to both faces of the central core by penetration into the interstitial spaces in the central core and an outer layer of paper or card of high tensile strength bonded to each intermediate layer, each of said paper layers
25 being pretensioned by being applied to said plaster layers whilst the plaster layers are still wet.

- 30 (2) A building board as claimed in Claim 1 wherein tongues and/or grooves are provided on two longitudinal edges to enable the boards to be joined in edge-to-edge relationship.

(3) A building board as claimed in Claim 1 wherein the surface of the board adjacent the longitudinal edges thereof is recessed to
35 accommodate a jointing strip.

(4) A building board as claimed in any one of the preceding claims wherein the foraminous core is woodwool cement.

(5) A building board as claimed in Claims 1, 2 or 3 wherein the foraminous core is expanded polystyrene, polyurethane foam, foamed plaster, foamed concrete or vermiculite plaster.
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(6) A building board substantially as herein described and as shown in the accompanying drawings.
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(7) A method of producing a building board as claimed in any one of the preceding claims which comprises feeding a slab of
50 foraminous material between rollers, applying a slurry of plaster to both surfaces of the slab so that the plaster flows into the surface or outside cavities in the slab and becomes firmly bonded thereto, applying an outer
55 layer of paper or card having a high tensile strength to the wet slurry on both faces and allowing or causing the intermediate and outer layers to dry.

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