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(54) **WOOD SUBSTITUTE STRUCTURAL FRAME MEMBER**

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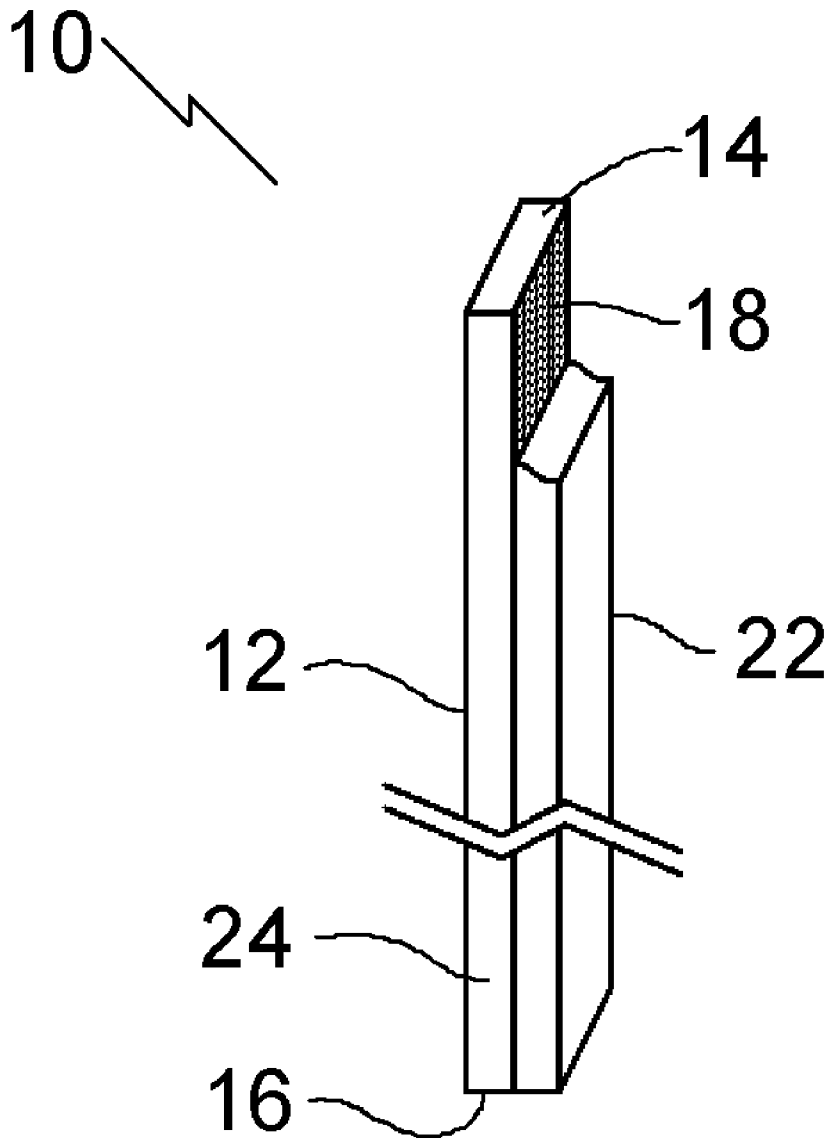
(57) **ABSTRACT**

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A wood substitute structural frame member includes an elongated body formed of one of calcium silicate or magnesium oxide. The body is of a density that can accept fasteners without cracking or splitting. The elongate body has a first end and a second end. A reinforcing mesh is embedded in the body and extends between the first end and the second end.

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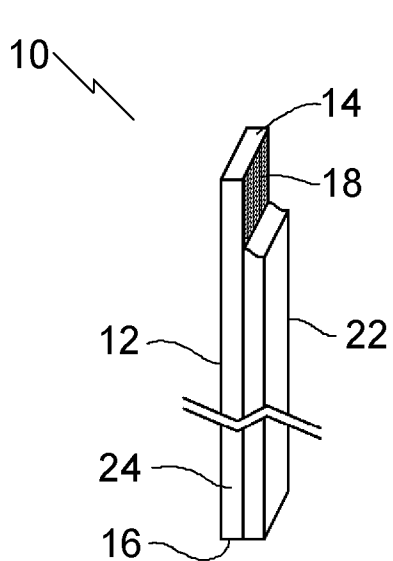


FIG. 1

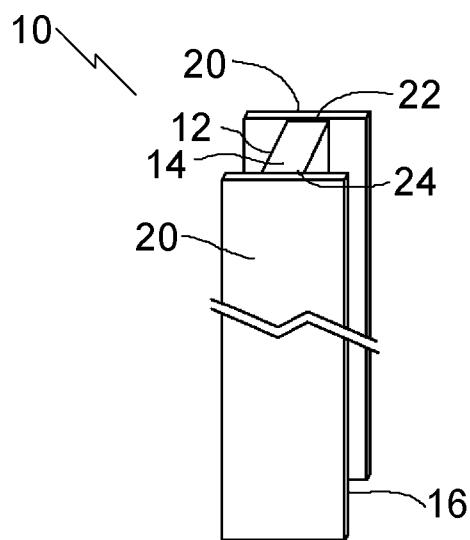


FIG. 2

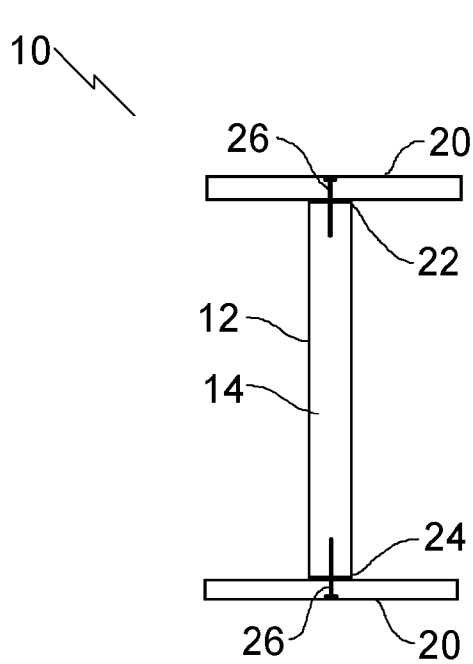


FIG. 3

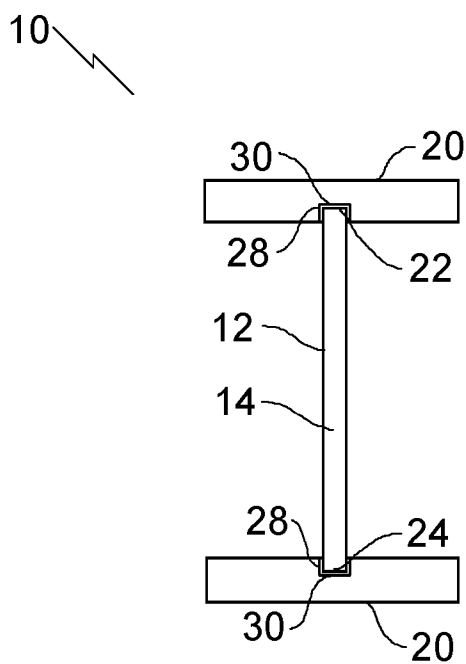


FIG. 4

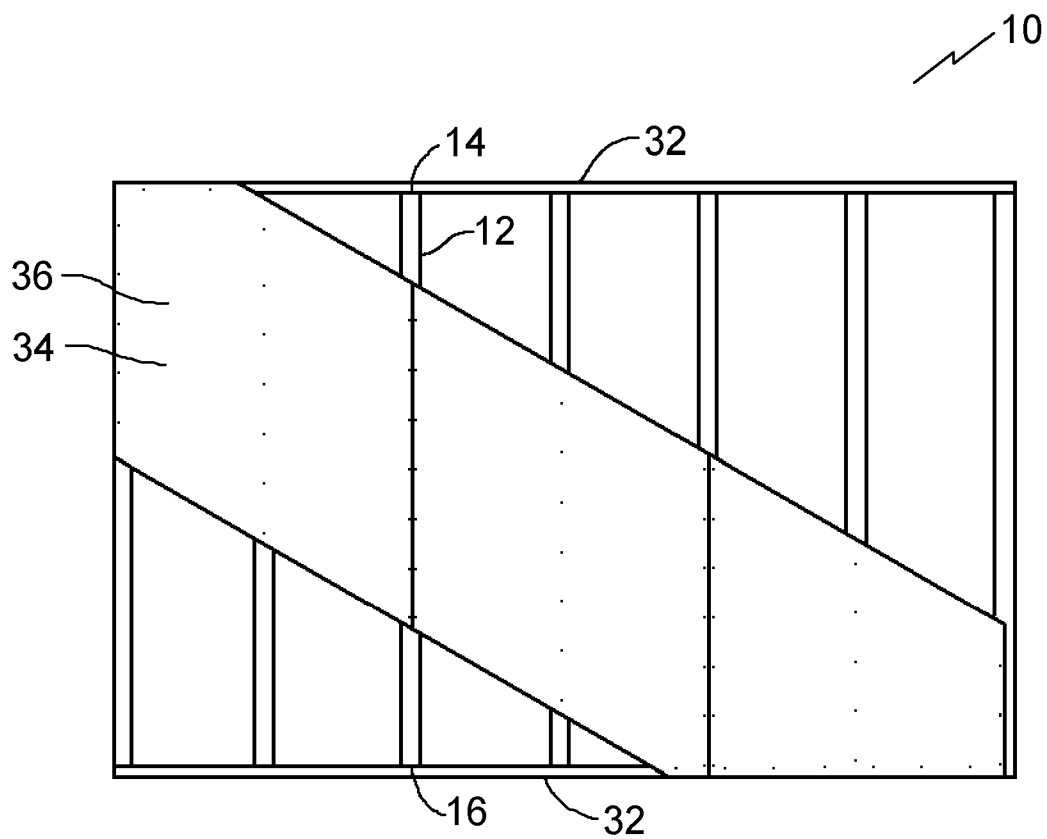


FIG. 5

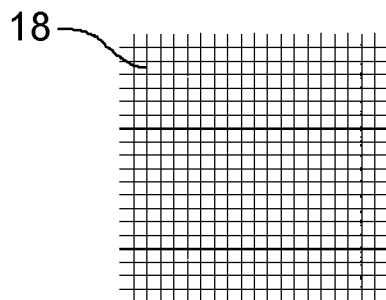


FIG. 6

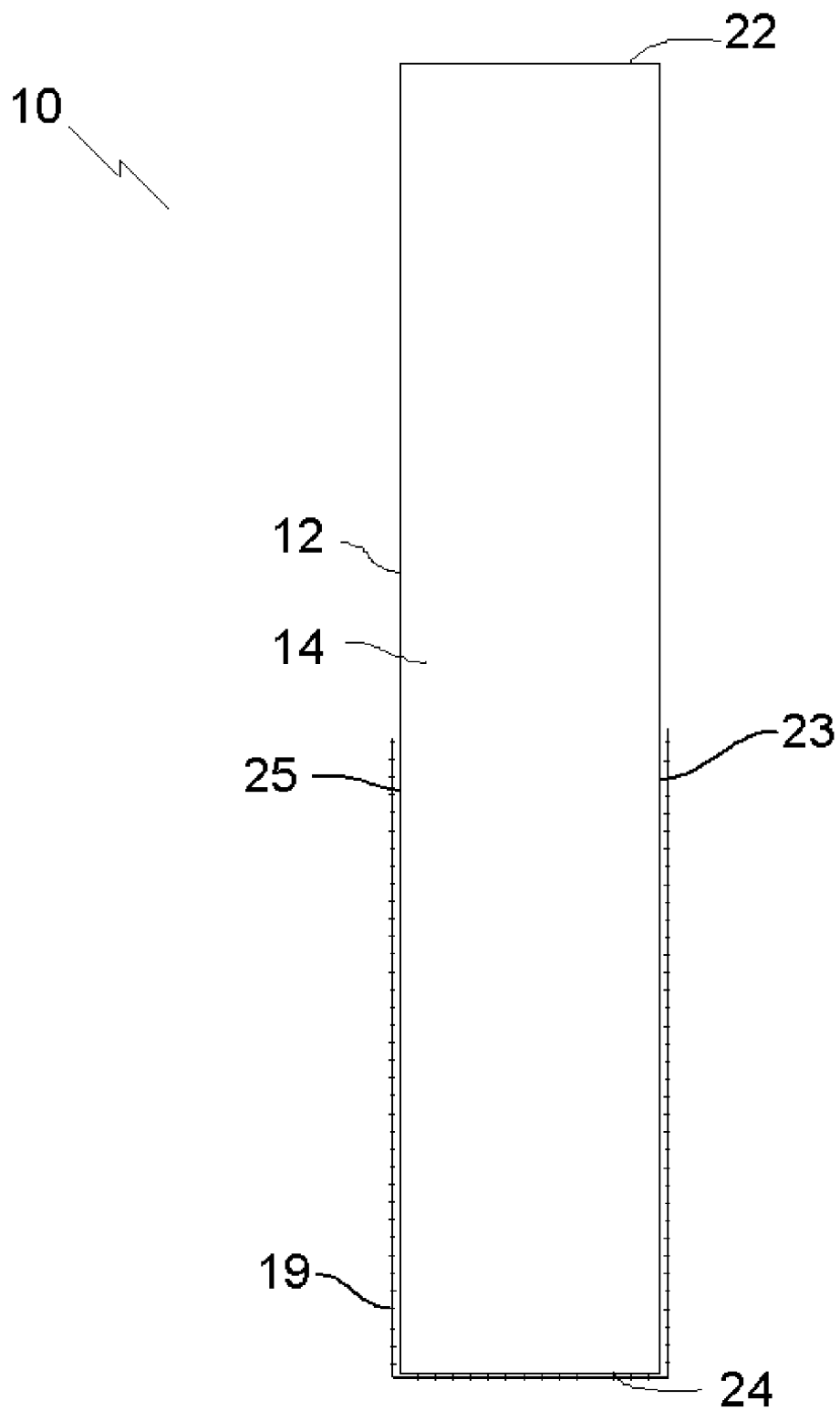


FIG. 7

**WOOD SUBSTITUTE STRUCTURAL FRAME MEMBER**

**FIELD**

[0001] The present application relates to a structural frame member that can be used as a substitute for a wood stud in construction.

**BACKGROUND**

[0002] Gordon Ritchie has developed fire resistant construction panels, such as are described in Canadian Patent Applications 2,498,562; 2,480,499; and 2,472,999. These panels were initially built using wood for structural framing members. The wood was treated in order to give it a degree of resistance to water, insect infestations and mould. However, the presence of the wood structural framing members limited the ability of the panels to resist fire.

**SUMMARY**

[0003] There is provided a wood substitute structural frame member, including an elongated body formed of one of calcium silicate or magnesium oxide. The body is of a density that can accept fasteners without cracking or splitting. The elongate body has a first end and a second end. A reinforcing mesh is embedded in the body and extends between the first end and the second end.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0004] These and other features will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to be in any way limiting, wherein:

[0005] FIG. 1 is a partially cutaway perspective view of a wood substitute frame structural member.

[0006] FIG. 2 is a perspective view of a variation of the wood substitute frame structural member.

[0007] FIG. 3 is an end elevation view of the variation of the wood substitute frame structural member illustrated in FIG. 2.

[0008] FIG. 4 is an end elevation view of a further variation of the wood substitute frame structural member.

[0009] FIG. 5 is a partially cutaway side elevation view of a structure made from the wood substitute frame member of FIG. 1.

[0010] FIG. 6 is a top plan view of a reinforcing mesh.

[0011] FIG. 7 is an end elevation view of the wood substitute frame structural member of FIG. 1, with the reinforcing mesh along its edges.

**DETAILED DESCRIPTION**

[0012] A wood substitute structural frame member generally identified by reference numeral 10, will now be described with reference to FIG. 1 through 7.

[0013] Structure and Relationship of Parts:

[0014] Referring to FIG. 1, wood substitute structural frame member 10 includes an elongated body 12 formed of one of calcium silicate or magnesium oxide. Body 12 is of a density that can accept fasteners without cracking or splitting. Elongate body 12 has a first end 14 and a second end 16 with a reinforcing mesh 18 embedded in body 12 that extends between first end 14 and second end 16. Preferably, reinforcing

mesh 18, shown in FIG. 6, is a stucco armour mesh or a reinforcing mesh of fibreglass. Referring to FIG. 1, while reinforcing mesh 18 is shown as being placed in the middle, it will be understood that multiple layers of mesh 18 may be present, and in different orientations within body 12. For example, referring to FIG. 7, a reinforcing substrate, such as reinforcing mesh 19 or other flexible substrate capable of providing adequate structural support may be positioned along a first side edge 22 or a second side edge 24 of body 12 such that it extends between ends 14 and 16. Looking down body 12, a length of reinforcing mesh 19 is provided, attached to a first face 23 and a second face 25 and wrapped around either first side edge 22 or second side edge 24 so it is connected to three sides body 12. Substrate 19 provides additional structural strength to body 12. It is preferred that both reinforcing mesh 19 and reinforcing mesh 18 be used.

[0015] It will be understood that wood substitute frame member 10 may have different cross-sectional shapes. Referring to FIG. 7, wood substitute frame member 10 has a rectangular cross-section, such that body 12 and therefore wood substitute frame member 10 have a parallelepiped shape. Referring to FIG. 4, body 12 is constructed to be more narrow than in FIG. 2 or FIG. 3. Referring to FIG. 2, side plates 20 are attached to first side edge 22 and second side edge 24 of body 12, such that wood substitute frame member 10 has an I-shaped cross-section. In FIG. 3, side plates 20 have been attached by fasteners 26. In FIG. 4, side plates 20 are attached by adhesive 28 applied in grooves 30 of side plates 20. Side plates 20 are formed of one of calcium silicate or magnesium oxide and act to retard calcification of body 12.

[0016] Referring to FIG. 5, end plates 32 are attached at each of first end 14 and second end 16 of body 12 by using either fasteners or adhesive. Body 12 may or may not have side plates 20 as shown in FIGS. 3 and 4. End plates 32 may be attached to multiple wood substitute frame members 10 to form a structural element 34 with fire resistant panels 36 that can then be used in building construction, for example, as a wall, roof or ceiling, floor, or in a basement. End plates 32 are formed of one of calcium silicate or magnesium oxide to retard calcification of body 12.

[0017] Operation:

[0018] Referring to FIG. 1, wood substitute structural frame member 10 is formed by compressing calcium silicate or magnesium oxide into parallelepiped body 12 having reinforcing mesh 18 within. Referring to FIG. 2 through 4, body 12 may be of varying thicknesses. Referring to FIG. 3, side plates 20 may be attached to body 12 using fasteners 26, or, referring to FIG. 4, by applying adhesive 28 in grooves 30. Referring to FIG. 5, end plates 32 may then be attached to first end 14 and second end 16 of body 12. Multiple bodies 12 may be attached together in this manner to form a structural element to be used in building construction.

[0019] Cautionary Warnings:

[0020] Calcium silicate and magnesium oxide are, in and of themselves, unsuitable for this application. A first problem that had to be addressed was a lack of strength. This was addressed by inserting a reinforcing mesh running the length of the body. The greater the strength of the mesh, the greater the strength of the body. Best results have, to date, been obtained through the use of a stucco armour mesh used to reinforce stucco. The stucco armour mesh comes in a variety of strengths, all of which appear to have utility depending upon the rigours of the application. In initial test, structural members were tested having only reinforcing mesh 18. When

reinforcing mesh 19 was added a substantial improvement was noted in test results. Experiments were then conducted with various grades of armour mesh. The stronger the armour mesh, the better the performance. A second problem that had to be addressed was fasteners cracking and splitting the body. The body is formed by a pressure forming technique—usually a pressure rolling technique with pressure being applied by rollers. It was determined that by adjusting the pressure applied by the rollers, the density of the body could be controlled. The greater the density, the greater the tendency to crack and split when fasteners were inserted. However, as density is decreased, a point is reached at which fasteners can interact with the body in a manner similar to wood.

**[0021]** The mineral based body formed with calcium silicate or magnesium oxide is water resistant, such that, while some water may be absorbed, it will not break down. It does not provide nutrients for insects or mould. It does not contribute to fire or the spread of fire. It will, eventually, calcify when exposed to extreme heat for prolonged periods. The strength of the body can be further increased to prevent bowing under axial loading, by securing sheeting (preferably fire resistant sheeting) between a frame formed from a number of the bodies. The cavities between the bodies forming the frame can be insulated with a fire resistant foam insulation or a fire resistant mineral wool insulation.

**[0022]** In this patent document, the word “comprising” is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article “a” does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

**[0023]** It will be apparent to one skilled in the art that modifications may be made to the illustrated embodiment without departing from the spirit and scope defined in the Claims.

What is claimed is:

- 1. A wood substitute structural frame member, comprising: an elongated body formed of one of calcium silicate or magnesium oxide, the body being of a density that can accept fasteners without cracking or splitting, the elongate body having a first end and a second end; and a reinforcing mesh embedded in the body and extending between the first end and the second end.
- 2. The wood substitute structural frame member of claim 1, wherein the body has a parallelepiped shape.
- 3. The wood substitute structural frame member of claim 1, wherein the reinforcing mesh is a stucco armour mesh.
- 4. The wood substitute structural frame member of claim 1, wherein the reinforcing mesh is a reinforcing mesh of fibreglass.

5. The wood substitute structural frame member of claim 1, wherein end plates are positioned at each of the first end and the second end of the body, the end plates being formed of one of calcium silicate or magnesium oxide to retard calcification of the body.

6. The wood substitute structural frame member of claim 5, wherein the end plates are secured by one of fasteners or adhesives.

7. The wood substitute structural frame member of claim 1, wherein side plates are positioned on a first side edge and a second side edge of the body, the side plates being formed of one of calcium silicate or magnesium oxide to retard calcification of the body.

8. The wood substitute structural frame member of claim 7, wherein the side plates are secured by one of fasteners or adhesives.

9. The wood substitute structural frame member of claim 1, wherein a supplemental reinforcing substrate is connected along at least one of a first face or a second face of the body for reinforcing the body.

10. The wood substitute structural frame member of claim 9, wherein a supplemental flexible reinforcing substrate is attached to a first face and a second face and wraps around at least one of a first side edge or a second side edge.

11. A wood substitute structural frame member, comprising:

an elongated parallelepiped body formed of one of calcium silicate or magnesium oxide, the body being of a density that can accept fasteners without cracking or splitting, the elongate body having a first end, a second end, a first face, a second face, a first side edge and a second side edge;

a reinforcing mesh embedded in the body and extending between the first end and the second end; and

a supplemental flexible reinforcing substrate is attached to the first face and the second face and wraps around at least one of a first side edge or a second side edge.

12. The wood substitute structural frame member of claim 11, wherein the reinforcing mesh is a stucco armour mesh.

13. The wood substitute structural frame member of claim 11, wherein the reinforcing mesh is a reinforcing mesh of fibreglass.

14. The wood substitute structural frame member of claim 11, wherein end plates are positioned at each of the first end and the second end of the body, the end plates being formed of one of calcium silicate or magnesium oxide.

15. The wood substitute structural frame member of claim 11, wherein side plates are positioned on a first side edge and a second side edge of the body, the side plates being formed of one of calcium silicate or magnesium oxide.

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