June 29, 1954 C. E. STAHL 2,682,089

LIGHTWEIGHT STRUCTURAL SECTION

Filed Oct. 13, 1951 2 Sheets-Sheet 1

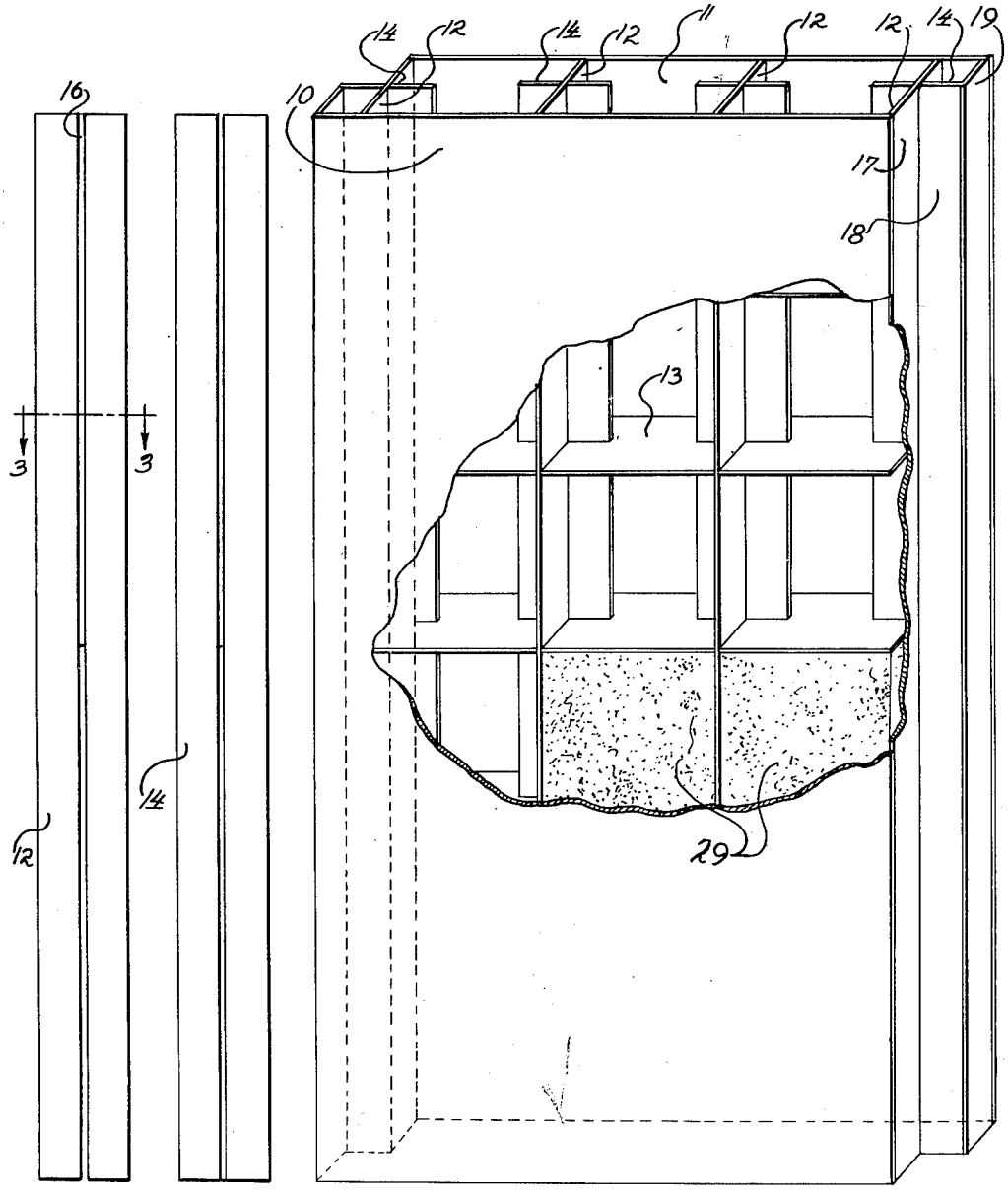


Fig. 2

Fig. 1

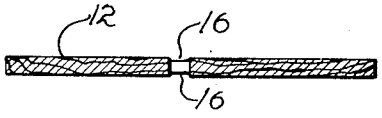


Fig. 3

INVENTOR
Clarence E. Stahl

BY Williamson & Williamson
ATTORNEYS

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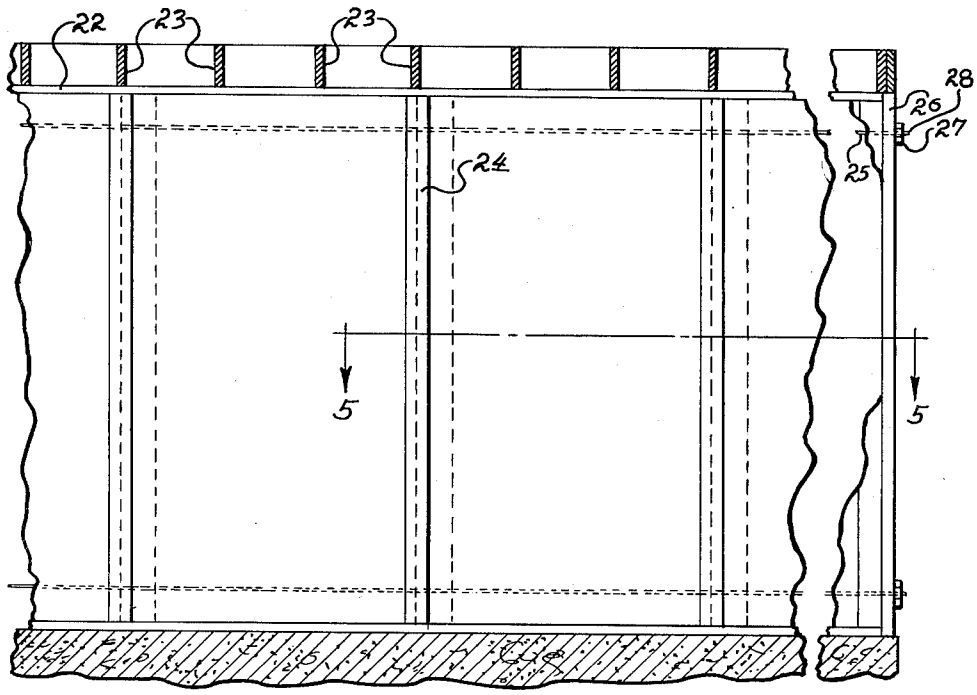


Fig. 4

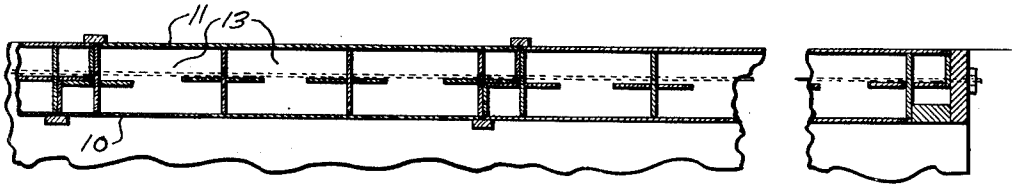


Fig. 5

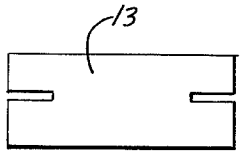


Fig. 6

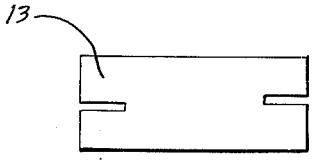


Fig. 7

INVENTOR
Clarence E. Stahl
BY
Williamson & Williamson
ATTORNEYS

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LIGHTWEIGHT STRUCTURAL SECTION

Clarence E. Stahl, Minneapolis, Minn.

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5 Claims. (Cl. 20—15)

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This invention relates to light weight structural building sections and more particularly to the unitary type of structural section where the component parts thereof are secured together in integral fashion for cooperation to resist the strains of a load bearing nature.

It is a principal object of this invention to provide for a structural building section which is composed of thin membranes strategically constructed to gain a great amount of strength for the weight of material used.

It is a further object of the invention to provide for a structural building section in which the inside and outside surfaces are finished and ready for use.

It is another object of the invention to construct a building section which will utilize the longitudinal strength of membraned material such as plywood to full advantage by properly bracing the membranes at various positions so as to strengthen the lateral weaknesses in long thin columns by dividing them into short thin columns.

It is a further object of the invention to provide for an efficient light weight building section which has load bearing properties and inherently has good heat insulation properties.

It is yet another object of the invention to provide for an extremely light building section which may be easily transported from the place of manufacture to the site where the building is being constructed and which when secured in place constitutes a finished load bearing and heat insulating wall section which requires no further modification or finishing.

It is a still further object of the invention to provide for an integrally webbed building section having high strength and good inherent insulating properties which may be cut as by sawing into various shapes, each of which will retain its said properties, for incorporation into a building.

These and other objects and advantages of my invention will be more apparent from the following description made in connection with the accompanying drawings wherein like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a side elevation of my building section with a portion of a membrane panel removed to show the internal cellular structure.

Fig. 2 shows a web or stud strip together with its companion rib strip.

Fig. 3 shows a cross section of the stud strip in Fig. 2 looking in the direction of the arrows 3—3.

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Fig. 4 shows a plurality of my construction sections in load bearing position between the sill and plate of a building.

Fig. 5 shows a horizontal section of the wall structure of Fig. 4 as viewed in the direction of arrows 5—5.

Fig. 6 shows the notched membrane spacing sheet used in some of the cells of my unit; and

Fig. 7 shows a membrane spacing sheet notched for cooperation with certain other cells in my construction sections.

Referring now particularly to the drawings my invention comprises a building section made up of spaced parallel sheets 10 and 11 as viewed in Fig. 1. These sheets 10 and 11 may be made of any suitable construction material having a high longitudinal strength such as plywood, plastic sheets or asbestos-cement composition panels. In general I refer to these thin construction materials as membranes since they are thin and flexible if unsupported. It is within the contemplation of this invention to have the membranes or panels 10 and 11 completely finished in predecorated form or finished in readiness for decoration so as to require no further modification after the units or sections are delivered to a construction job for use in constructing a building.

In order to gain the high strength and efficiency in my building section which characterizes it as a load bearing structure I provide lateral membranes 12 for coextending between the membranes or panels 10 and 11 for maintaining them in spaced parallel relation. The membranes 12 constituting my web or stud strips may be formed integrally with the panel membranes 10 and 11 or may be attached edgewise to the inner surfaces thereof by such means as high strength, waterproof adhesives which are presently marketed for extremely strong and permanent joints. For the sake of appearance I prefer to use a material such as plywood for my panels 10 and 11. I find, however, that for the stud or web strips 12 I may employ membranes cut from wood waste material or from wood material which is not normally used in building construction because of its resinous nature, unpleasing appearance or tendency to warp and twist when supplied in board form. Thus, I may use membrane constructed of such woods as elm, cottonwood, box elder and southern pine, which when cut and properly dried will serve as excellent web or stud strips if glued or otherwise secured to the inner surfaces of the panels 10 and 11. These webs or studs 12 may be placed at spaced intervals

longitudinally of the panels 10 and 11 and extending for the full length thereof in order to form a bearing surface together with the top and bottom edges of panels 10 and 11 as viewed in Figs. 1 and 4. Where my construction section is made of ordinary four foot by eight foot plywood panels I prefer to use at least four webs or studs across the four foot width.

The membranes 10 and 11 together with the membranes 12 form cellular spaces which extend for the full length of the section. The cellular structure comprising only the membranes 10, 11 and 12 does not have proper load bearing characteristics because of the unbraced long and thin columns which exist in such structure. I find therefore that the inherent lateral weaknesses of the membranes 10, 11 and 12 can be overcome by providing further lateral braces or spacing sheets 13 which may be constructed as a membrane from any suitable material having good compressive strength. Here again I may employ the cheap woods mentioned above with a high degree of success.

To further aid in strengthening my construction section I find it useful to employ a still further membrane such as rib strips 14 for mortising into the web or stud strips 12. Referring to Fig. 2 the stud strips 12 may be provided with a longitudinal slot 15 extending for substantially half its length and a grooved continuation thereof for the remainder of its length as shown at 16 in Fig. 2. A cross section of the stud strip 12 on lines 3—3 of Fig. 2 is shown in Fig. 3. The rib strip 14 may be identical with the construction of the stud strip 12 in which case there is economy in the manufacture of like parts. At one or both side edges of the construction section a face 17 of the end stud strip 12 and a face 18 of the last rib 14 may form an off-set joint for cooperation with the similar joint of another construction section whereby a continuous wall may be formed by mounting a plurality of consecutive sections in place. It is understood that various other joint structures may be employed and will readily suggest themselves to one practicing my invention. For further strength a membrane strip 19 may join the outer edges of the end membranes 12 and 14 to complete the joint structure of the section edge. It is, of course, understood that the opposing edge on each building section may be similarly constructed with the joint members reversely positioned. The spacing sheets 13 are shown in more detail in Figs. 6 and 7. The pattern A as shown in Fig. 6 is used where the ribs 14 are in alignment with the same cell as indicated by letters A in the horizontal section shown in Fig. 5, and the pattern B of Fig. 7 is used for the spacing sheets 13 where the ribs in each cell are out of alignment adjacent the side joints as also illustrated in Fig. 5.

It will be noted that my building section adapts itself to cutting or sawing just as in the case of solid lumber. This is true because of the integral nature of my arrangement of membranes. Corners may be cut at an angle, for example, while maintaining the membrane ends in a plane for stressed contact. Areas may be cut away or the entire section may be cut through by a saw and the edges remaining will always be able to transmit the required strength to such adjacent structure as lintels, sills, plates, and framing members in general.

In constructing a building using my load bearing sections I may align them in a wall as shown in Fig. 4 placing them upon the sill 20 which in turn rests upon the foundation 21 of the building. Over the top of the construction sections is a plate 22 which likewise contacts all the longitudinal membranes in each section. Joists 23 may be attached to plate 22 as is common in building constructions. Batten or molding strips 24 may be placed over the joints between the building sections in order to provide a weatherproof and pleasing appearance. It is understood that such strips 24 may be used in both inside and outside construction.

In order to further strengthen the wall structure I may provide tie rods or cables 25 extending through a plurality of building sections and tied at either end to a fixed stud 26 by means of nut 27 on threaded end 28.

It may be seen that I have constructed a novel and unusual building section without the use of any heavy studs or bracing, and that such a section will have good load bearing properties as well as inherent insulating qualities. At the same time, I have provided for an integral and complete wall having the inner and outer surfaces finished in pleasing appearance and every portion of which functions as a strengthening member. My building section, therefore, differentiates from such conventional structure as plastered inside walls and stuccoed outer walls where the finished construction not only lacks structural properties but becomes a burden on the remaining structure which consequently must be further stressed to carry the additional load.

In spite of the excellent inherent heat insulating properties of my building construction the cellular construction adapts itself ideally for the inclusion of additional insulation such as shown at 29 in Fig. 1. The spacing sheets 13 divide each cell into separate compartments each of which has its allotted proportion of insulating material 29. Thus, for an insulating material in loose form, such as vermiculite or granular rock wool the spacing sheets 13 prevent the insulation from settling in one long column and leaving a substantially uninsulated area near the top of the wall where it is most needed, as often occurs where loose insulation is blown or poured into ordinary walls between the studs thereof.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of my invention.

What I claim is:

1. In a unitary structural building section made entirely of fibrous sheet material having a high strength per unit weight the combination of a first thin panel having a high longitudinal strength, a second thin panel having a high longitudinal strength and disposed in a spaced parallel relation to said first panel, a plurality of generally longitudinal spaced thin and straight stud strips having high longitudinal strength and adhesively coextending between the parallel panels substantially for the length thereof, rib strips longitudinally attached by adhesive to said stud strips intermediate said parallel panels, each rib strip lying in spaced relation with that of the adjacent stud strip, and spacing sheets having at least a high compressive strength disposed in bracing engagement across each adjacent pair of stud strips.

2. A light weight non-metallic load bearing construction unit comprising a pair of thin panels having high compressive and tensile strength disposed in parallel spaced relation, a plurality of thin and straight longitudinal webs each having

parallel side edges in rigidly secured engagement with the opposed inner faces of said pair of panels coextending continuously for the entire length of said parallel panels and in spaced relation one with the other, thin rib members disposed medially of the side edges of said web members and secured rigidly thereto for substantially their entire length in order to reinforce the web members without adding unnecessary weight to said unit, and additional supporting means for preventing flexing of said web members under stress comprising a plurality of spacing members disposed laterally in bracing relation between adjoining web members.

3. A light weight non-metallic load bearing construction unit comprising a pair of thin panels having high compressive and tensile strength and disposed in parallel relation, a multiplicity of thin and straight longitudinal webs each having parallel side edges rigidly joined with the opposed inner faces of said pair of panels for substantially the entire length thereof, said webs being in spaced parallel relation one with the other, thin longitudinal rib members disposed medially of the side edges of the web members and extending outwardly therefrom throughout substantially their entire length in order to reinforce the web members without adding unnecessary weight to said unit, and additional supporting means for preventing flexing of said web members under stress comprising a plurality of spacing sheets disposed laterally in bracing relation between adjoining web members, said spacing sheets being also secured in edgewise relation to opposed faces of said pair of panels and lying in spaced parallel relation one with the other.

4. A light weight non-metallic load bearing construction unit with excellent insulating properties comprising a pair of thin panels having high compressive and tensile strength disposed in parallel spaced relation, a multiplicity of thin and straight longitudinal webs each having parallel side edges in rigidly secured engagement with the opposed inner faces of said pair of panels and coextending in spaced parallel relation one with the other continuously for the entire length of

said unit, thin longitudinal rib members formed outwardly and medially of each of said web members and at each face thereof said rib members of adjacent webs being spaced from each other so as to establish communication across the entire width of said panels through the spaced portions between web members, spacing sheets disposed laterally in bracing relation between adjoining web members, insulation material across said panels and within the spaces defined by the web members and spacing sheets, said insulation being insertable from one side of the construction unit before final securing of the last panel to be joined in the building of the unit.

5. A light weight non-metallic load bearing construction unit having cellular internal structure comprising a pair of thin panels having high compressive and tensile strength disposed in parallel spaced relation, a plurality of reinforced longitudinal members each consisting in a thin stud strip having parallel side edges in rigid engagement with the opposed inner faces of said pair of panels continuously for the entire length thereof and being slotted medially of said parallel side edges from one end to a point intermediate the ends thereof, and a thin longitudinal rib strip for each of said stud strips having a complementary groove cut out from one end to a point intermediate its ends said stud strip and rib strip being adhesively jointed in interfitting relation, and spacing sheets disposed laterally in bracing relation and coextensively across the inner space between adjoining stud strips, said spacing sheets being secured in edgewise relation to opposed inner faces of said pair of thin panels, opposed faces of adjacent stud strips and the sides and edges of the opposed rib strips.

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