

[54] **BUILDING COMPONENT AND SYSTEM**

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[63] Continuation of Ser. No. 617,669, Feb. 21, 1967, abandoned.

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[51] Int. Cl.**E04b 1/10**, E04b 1/54

[58] Field of Search.....52/173, 436, 580, 593, 595

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[57] **ABSTRACT**

A building structure, e.g. a house that consists of generally-similar basic components and that can be economically manufactured at a location remote from the building site to permit rapid and simple assembly. The elemental building components comprise a generally rectangular frame (wood) which is variously closed at its sides to provide a partial wall, roof or floor. Walls are shown to include windows, etc.

The exterior edges of the basic component frame define matingly-keyed sections whereby a plurality of the components may be permanently interlocked by adhesive. The matingly-keyed edges include an elongate section that is less than a semi-cylinder and has a width that is less than the frame width. The female sections (concave) carry an adhesive, either as encapsulated beads of glue or an adhesive tape bearing a release sheet. In a structure of the elemental components, the adhesive is contained between the mating sections (concave and convex) to bond the building components together.

4 Claims, 8 Drawing Figures

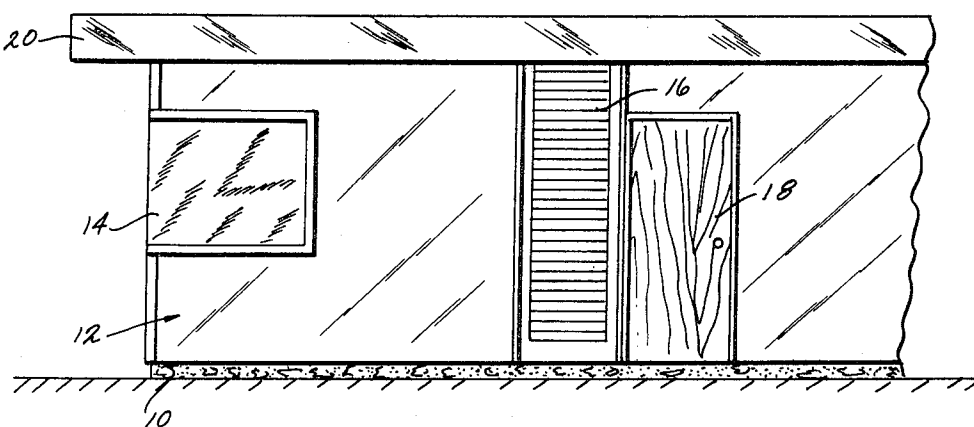


FIG. 1

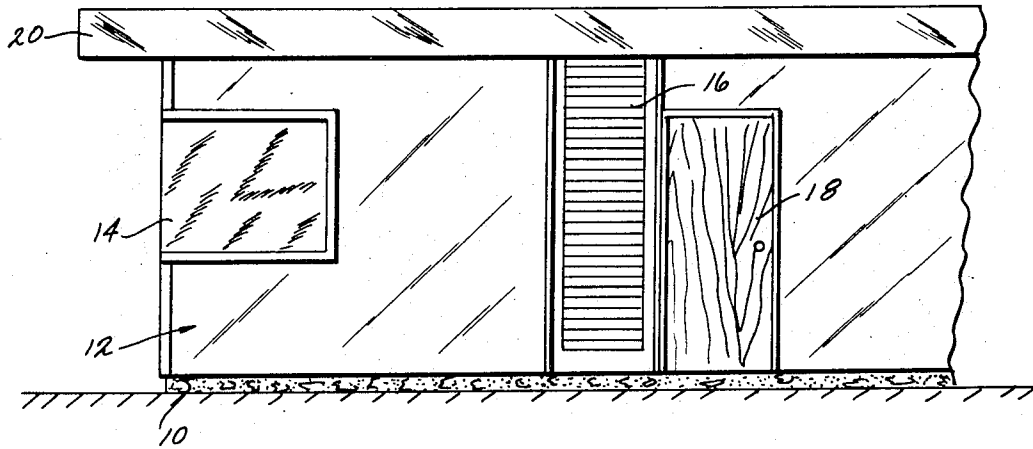


FIG. 2

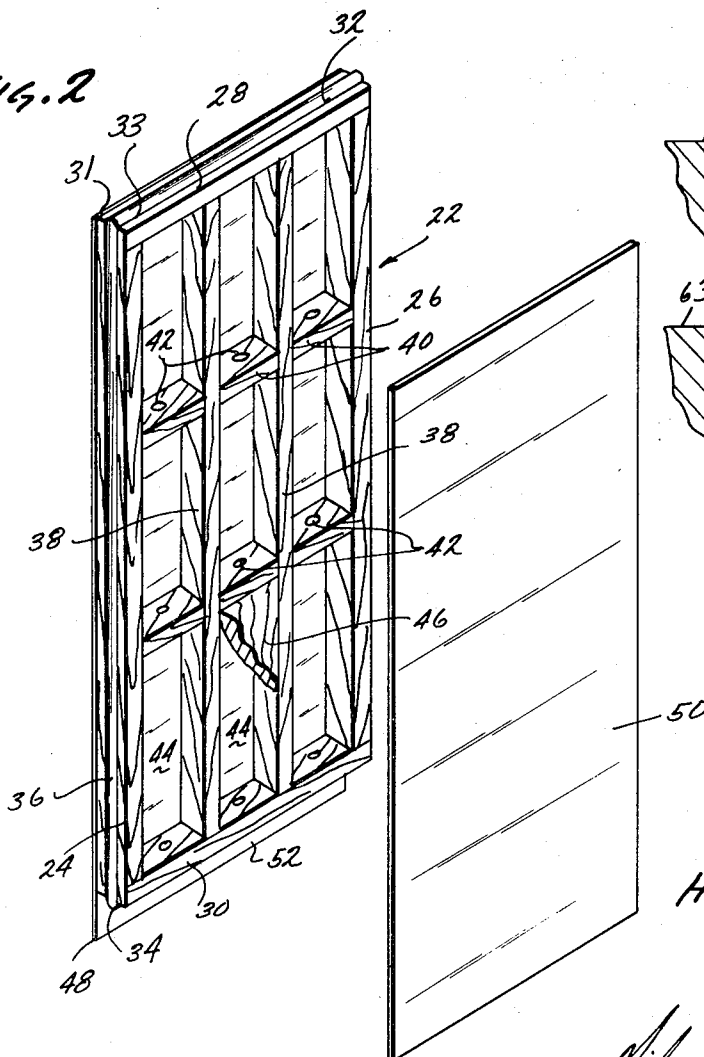


FIG. 3

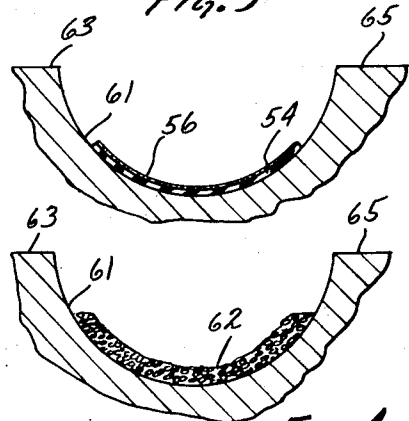


FIG. 4

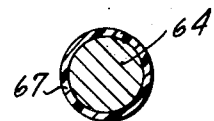
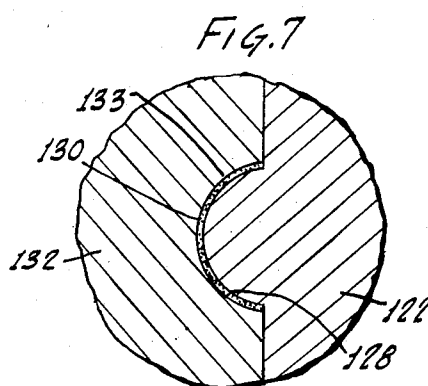
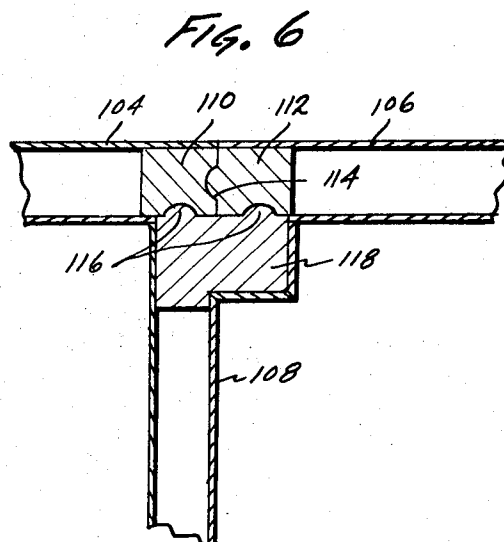
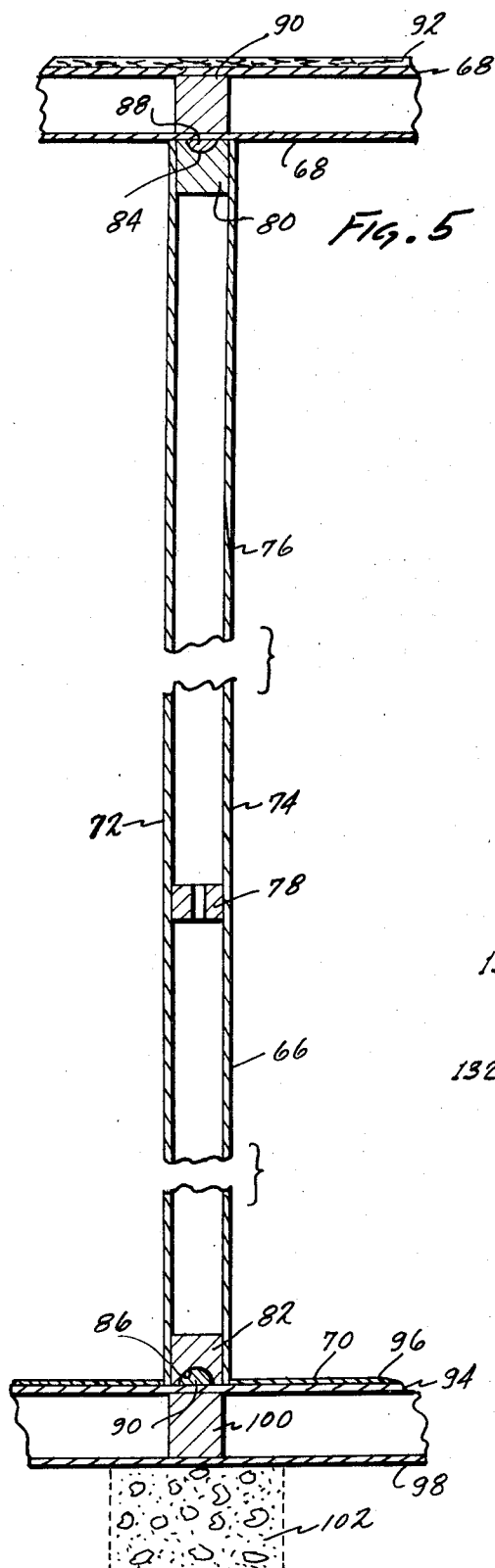


FIG. 4A

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BUILDING COMPONENT AND SYSTEM

This application is a continuing application of Ser. No. 617,669 filed Feb. 21, 1967 entitled BUILDING COMPONENT AND SYSTEM, now abandoned.

BACKGROUND OF THE INVENTION

In recent years substantial efforts have been exerted to develop building techniques which would reduce the cost of construction. Of course, a large portion of construction costs result from jobsite labor. For example, in the field of residential construction, labor costs are quite high because structures are erected on the jobsite from elemental building materials. That is, conventional practice in the residential construction industry involves erection of a lumber frame, fastened together with nails, and upon which shelter materials are affixed to close the building.

As a general consideration, jobsite labor is considerably more expensive than factory labor and furthermore rates of productivity on a jobsite are considerably less than in a factory. As a result of these differences, certain building structures have been previously proposed with the objective of economically prefabricating buildings for jobsite assembly. Although such techniques have been proposed and reduced to practice in some instances, in general, prefabrication of residential and other buildings has not come into widespread use. One of the problems involved with prior prefabrication techniques has involved the large number of completely different detailed pieces which had to be fabricated. That is, the construction of widely different pieces in a factory affords little saving over conventional practices of total jobsite construction. Furthermore, considerable difficulty has been experienced in mating, fitting and fastening prior prefabricated pieces together as a rigid enduring integral structure.

SUMMARY

The system hereof involves the use of generally-similar structural components which are employed for the walls, floor and roof of a building. The similarity of these structural components affords considerable economy in their production. The components comprise a basic frame defining a somewhat rectangular configuration (that may be provided with reinforcement) and which is formed to provide matingly keyed edges. The open sides of the frame are closed by one or more side panels depending on the intended use.

It has been determined that a specific form of fragmentary cylindrical keyed edge (less than a semicylinder) accomplishes a mating arrangement which affords a practical economical and lasting structure. More specifically, the fragmentary cylindrical keyed edges permit simple and easy joining in a somewhat balanced relationship. Furthermore, the female or concave edge may contain an adhesive element which is protected until it fixes abutting pairs of the structural components together.

In assembly, the basic components are formed to provide the structural framework of the building as well as the protective shell. Nails, or other fasteners requiring skilled labor and presenting other difficulties may be omitted from the building. Thus, various objects of a practical, economical and rapid system of construction are provided, which system may be effectively used for example in the erection of residential buildings.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawing, disclosing an illustrative embodiment of the present invention to exhibit the various objects and advantages hereof, sets forth as follows:

FIG. 1 is a fragmentary front elevation view of a structure incorporating the principles of the present invention.

FIG. 2 is an exploded perspective view of a building component employed in the structure of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken through a portion of the structure of FIG. 2;

FIG. 4 is a view similar to FIG. 3 disclosing an alternative structure hereof;

FIG. 4A is an enlarged fragmentary view of FIG. 4;

FIG. 5 is a fragmentary sectional view taken vertically through a portion of the structure of FIG. 1;

FIG. 6 is a fragmentary vertical sectional view taken through another portion of the structure of FIG. 1; and

FIG. 7 is an enlarged fragmentary sectional view taken through a junction structure in accordance herewith.

DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENT

Referring initially to FIG. 1, there is shown a portion of a residential building constructed in accordance with the present invention. The building is supported and anchored to a foundation or footing 10 directly supporting the structural walls 12. A view window 14, and a louvred light and air window 16 are integrated in the structure along with a door 18. The roof 20 is supported by the structural walls 12 as considered in detail below. The various structures that can be accomplished by the system hereof are limited only by imagination of the designer; therefore, FIG. 1 is merely illustrative of one portion of a rather simple building structure erected in accordance herewith. In the building as shown, the walls 12, the roof 20 and the floor are all formed of similar elemental components. These components are joined together along their edges which define elongate, symmetrical partial semicylindrical sections that provide several distinct advantages in mating to form an integral structure. One form of the basic building component is shown in FIG. 2 and will now be considered in detail.

A somewhat rectangular frame 22 basic to the component, is defined by vertical beams 24 and 26 which join in corner abutment with horizontal beams 28 and 30. In one successful embodiment, these beams have been cut from 3×3 inch lumber and the frames formed to outside dimensions of 9×4 feet. The horizontal beams 28 and 30 as shown in FIG. 2 define external male keyed edges. Specifically upper and lower edges define male cylindrical sections 32 and 34 which extend substantially the full exterior length along the beams 28 and 30 respectively. The male sections 32 and 34 are symmetrically centered on the beam edges and define less than a semicylinder possessing a width that is somewhat less than the width of the beams. As a result, flat aprons 31 and 33 are provided on either side of the male sections. A similar cylindrical male section is provided on the exterior surface of the vertical beam 26 while a mating concave or female section 26 is defined in the opposed beam 24.

It has been found desirable to provide the combined width of the aprons over approximately one fourth to one sixth the total edge of a beam. Therefore, for example, the aprons might each be $\frac{3}{8}$ inch wide while the width of the male or female section is $1\frac{1}{8}$ inches.

As indicated, the frame 22 is defined as a generally open rectangular frame incorporating lap corner joints which may be accomplished with any of a variety of adhesives or fasteners. The beams in the frame 22 are wood in the illustrative embodiment as are vertical reinforcing members 38 and traversing horizontal reinforcing members 30. The reinforcing members 38 and 40 are bored to provide vents 42 into the inner cavities 44 which allows air to move from cavity to cavity 44 to equalize the temperatures of dead air spaces. Insulation bats 46 or other insulating medium may be used to block sound and so on. The interior of the frame may be variously reinforced and closed; however, as shown in FIG. 2, the open sides of the frame 22 are closed by an exterior panel 48 and an interior panel 50. The panels 48 and 50 may be lapped over the edges of the frame 22, as by an extension 52 shown at the bottom of the exterior panel 48 as for lapping the building foundation or another component. The panels may comprise a variety of materials; however, in one instance of actual practice, exterior plywood has been found successful for use as the exterior panel 48 and tempered hardboard has been found successful as the interior panel 50. These panels may be affixed to the basic frame with glue or fasteners.

The component structure as shown in FIG. 2 may be varied by different closures for the basic frame to accomplish particular architectural objectives, depending upon whether the component is to be integrated in a roof, a floor, or a wall. For example, glass, plastic, roofing, flooring or virtually any sheet building material can be used as a closure panel. However, the basic component or modular unit remains substantially unchanged even though used in a floor or roof. That is, the basic unit incorporating a frame defining the matingly-keyed edges (as described) is readily adaptable for use in various locations of a building.

The building components as shown in FIG. 2 are adhesively joined along the mating edges and may include over lapping panels as shown. The female or concave edge may receive adhesive at the time it is manufactured. In one form hereof, the adhesive comprises a tape 54 (FIG. 3) bearing a release sheet 56. The tape 54 carries an adhesive and may comprise various materials one of which is a porous resiliently-deformable material that is saturated with an elastomeric adhesive as neoprene. In an alternative arrangement adhesive is provided as encapsulated glue beads 60 (FIG. 4) suspended in a suitable carrier 62, the beads or capsules being readily fracturable upon the application of pressure. The beads 64 may be held in place by a carrier of methyl-cellulose. It is to be noted that the placement of the adhesive within the female or concave section 61 between the aprons 63 and 65 affords considerable protection for the adhesive while the component is transported and handled.

It is also to be noted in FIGS. 3, 4, and 7 that as previously explained, the radius of curvature of the female section 61 is greater than the depth. This particular feature provides the "less than semicylinder section" of

previous reference, and affords considerable advantage in assembling the component structures. In this regard, it has also been found desirable to provide a slightly increased radius for the female sections over that of the male sections to accomplish more effective mating, i.e. some tolerance.

In considering the manner in which the basic components hereof are variously used, as in the structure of FIG. 1, reference will now be had to sectional FIGS. 5, 6 and 7. Initially referring to FIG. 5, there is shown a vertical sectional view through an interior wall 66 along with contiguous sections of the ceiling 68 and floor 70. The wall 66 includes interior panels 72 and 74 which may be formed as continuous sheets or partial sheets joined as by a scarf joint 76. The wall 74 incorporates reinforcing members 78 as shown along with an upper horizontal beam 80 and a lower horizontal beam 82. In this particular application, the panels 72 and 74 extend to cover frame beams 80 and 82 which are edged with female sections 84 and 86 respectively, which matingly engage male sections 88 and 90 that are adhesively secured respectively to the ceiling 68 and the floor 70 as at the factory. Of course, the mating engagement is permanently accomplished by adhesive or glue disposed therebetween as described above.

The ceiling 68 is formed by a building component as previously described with reference to FIG. 2, incorporating the basic frame (not shown), side panels 88, and an interior support member 90. The panel 88 carrying the roofing layer 92 may be preformed.

The floor 70 comprises a typical floor panel formed on the basic frame and includes a panel 94 that is surfaced with floor covering 96, and an exterior panel 98. The floor 70 also includes reinforcing members 100 as shown, and is provided support, as by a footing 102 placed under the interior wall.

Another roof and wall section is shown in FIG. 6 and affords a variation from that previously described. Specifically, FIG. 6 shows a ceiling formed by abutting building components 104 and 106 which are maintained in locking engagement by keyed edges along with an interior wall defined by a component 108. The components 104 and 106 include frame beams 110 and 112 respectively which have matingly keyed edges on perpendicular parallel surfaces, the vertical surfaces 114 of which are matingly engaged while the horizontal surfaces 116 matingly engage a double-section beam 118 comprising a part of the component 108. Of course, as previously described, each of the fragmentary cylindrical keyed edges are adhesively secured together with a mating member.

FIG. 7 is a sectional view through a mating joint. Specifically, a frame beam 122 defines a male keyed section 128 which is matingly received in a female section 130 of a beam 132 to provide the closed cylindrical space (occupied by adhesive 133) of substantially uniform thickness. Thus, any of a wide variety of structures can be accomplished in the keyed-frame components constructed in accordance herewith.

Considering the manufacture of building components constructed in accordance with the principles set forth herein, the basic frame beams may be manufactured of timbers employing any of a variety of linear machines to accomplish the fragmentary semicylinder keyed male and female sections. For example, the

female section may be formed by router techniques utilizing blades under which the beam passes. Similar machines may be employed to accomplish the male sections. Alternatively, if the beams are manufactured of other materials, e.g. plastic aluminum or the like, they may be extruded with the desired cross section.

After forming the beams, the frames are constructed and closed in accordance with the intended use of a particular component. The similarity of the frames results in considerable saving in production costs. In accordance with various construction needs, the closure panels may comprise tempered hardboard, plywood, plasterboard, asphalt board, glass, door frames, roofing, flooring, and so on.

In the design of a particular building, e.g. the residential building as shown in FIG. 1, a large number of somewhat-standard components will be employed, e.g. the standard wall component as shown in FIG. 2. Additionally, certain special components will be required as window-bearing components ceiling-joint components and so on. One of the great economies hereof stems from the fact that most of the components are standard. Furthermore, the non-standard components may be readily and easily formed utilizing the basic frame 22 (FIG. 2) sometimes with slight variation. A second great economy is obtained in the actual assembly or construction of the building utilizing the components as disclosed herein. Specifically, due to the partial semicylinder keyed sections on the frames 22, good mating connection and balance are afforded with little difficulty. Of course, some temporary brace may be desirable during erection until the glue or adhesive has set; however, such a technique presents little or no problem.

Considering the actual mating of a pair of keyed edges, the male section is simply forced into the groove or female section as shown in FIGS. 3 and 4. If the structure of FIG. 3 is employed, the release sheet 56 is removed prior to the union, leaving the tape 54 exposed to engage the male section. Upon forcing the two sections together the tape 54 (shown enlarged) may be somewhat deformed to accomplish the desired snug union.

In employing the adhesive bead structure as shown in FIG. 4, the male section upon forceable engagement with the female section as shown, fractures the beads 62 dispensing the glue 64 over the mating interior surfaces. Upon setting, the glue or adhesive bonds the members into an integral structure capable of withstanding considerable force and shock. In fact, tests have established that the glue joint can be stronger than the wood incorporated in the beams.

As suggested above, various applications in different embodiments of the basic structure hereof are large in number and it is readily apparent that the common beam frame defining matingly keyed edges may be widely adapted for different structures both as to type, size, and use. As a result, it is to be appreciated that the system hereof is not to be limited in accordance with the specific illustrated examples as set forth herein;

rather, the scope of the present invention is to be determined in accordance with the claims set forth below and forming a part hereof.

I claim:

1. A component building system, as to accomplish an enclosed structure, comprising:

a first frame member defining an open rectangular configuration having open sides including first wooden frame beams at the periphery of said frame;

at least one of said first wooden frame beams at an external edge thereof defining a single elongate partial semi-cylindrical male section having a radius of curvature greater than the projection thereof extending outward from said first frame member in the plane thereof, said one of said first wooden frame beams having an external edge further defining a pair of elongate flat side aprons extending perpendicular to the plane of said first frame on each side of said partial semi-cylindrical male section;

a second frame member defining an open rectangular configuration having open sides and including second wooden frame beams at the periphery of said frame;

at least one of said second frame beams at an external edge thereof defining a single elongate partial semi-cylindrical female section recessed to extend into said one of said second wooden frame beams in the plane thereof the radius of curvature of said female section being greater than its depth, said one of said second wooden frame beams having an external edge further defining a pair of elongate flat side aprons extending perpendicular to the plane of said second frame on each side of said partial semi-cylindrical female section, said female section of said second frame member and said male section of said first frame member defining a closed cylindrical space therebetween of substantially uniform thickness, in mating relationship between said external edges of said first and second frame members;

elastomeric adhesive means in said space, for adhesively securing said first and second frame members together;

and panel means affixed to said frame members for at least partially closing said frame members.

2. A system in accordance with claim 1 further including internal reinforcing members affixed within said frame member.

3. A building component system according to claim 1 wherein said panel means includes an exterior panel affixed to close one side of said frame and an interior panel affixed to close another side of each of said frames.

4. A component building system in accordance with claim 1 wherein said aprons are of substantially similar width and occupy substantially between one-fourth and one-sixth of the total width of said edges.

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