Feb. 22, 1966

N. EDGAR

3,236,014

PANEL ASSEMBLY JOINT

Filed Oct. 2, 1961

3 Sheets-Sheet 1

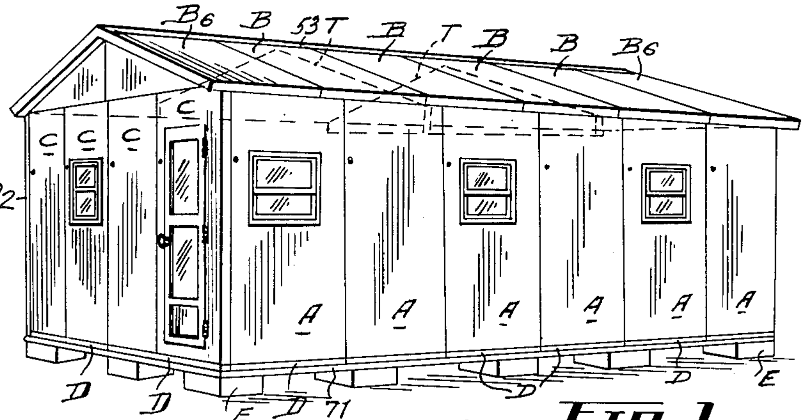

Fig. 1

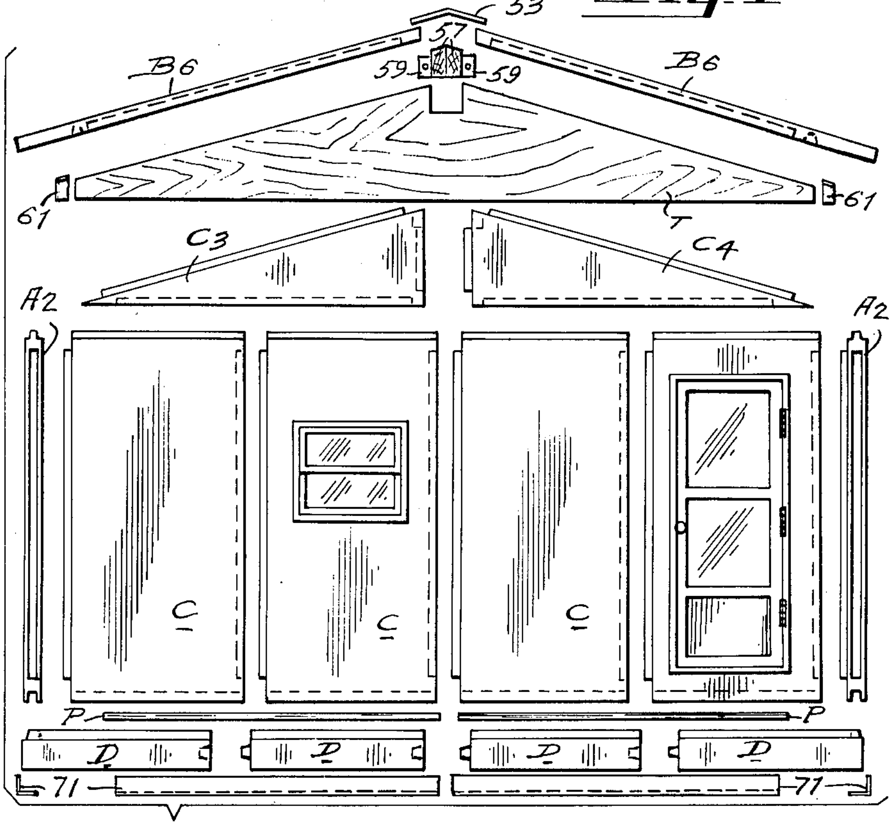

Fig. 2

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3 Sheets-Sheet 2

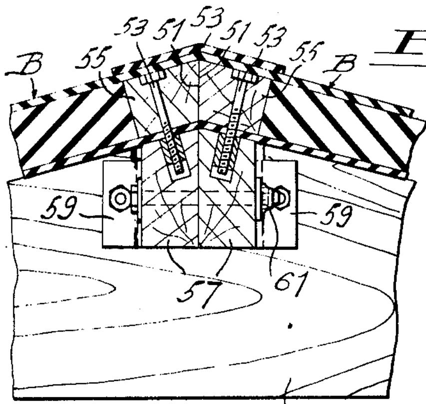

Fig. 4

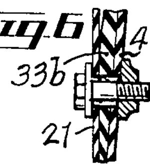

Fig. 6

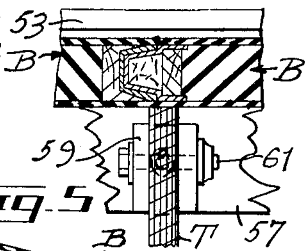

Fig. 5

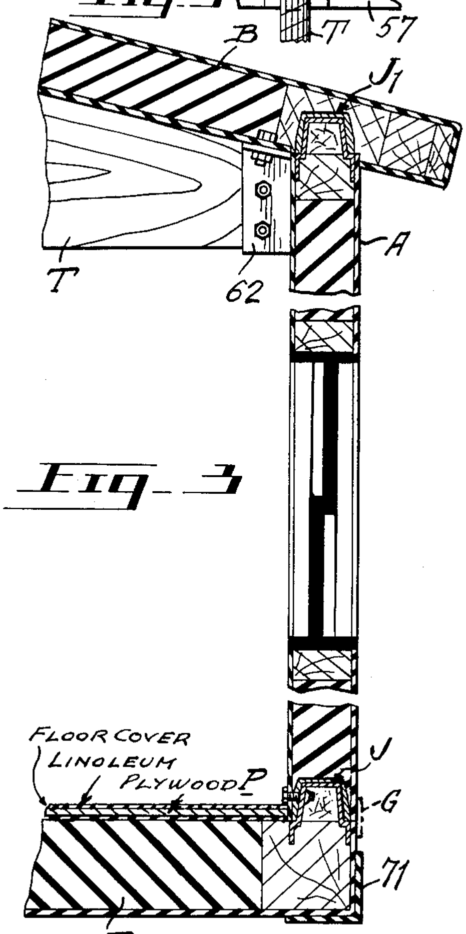

Fig. 3

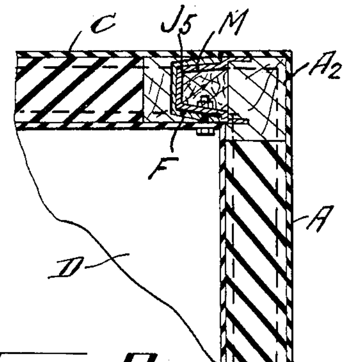

Fig. 9

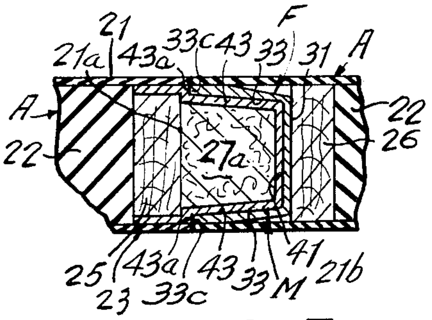

Fig. 7

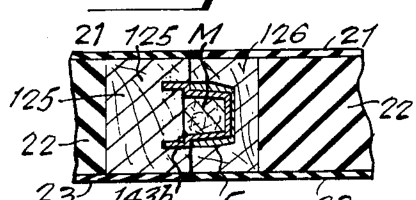

Fig. 8

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PANEL ASSEMBLY JOINT

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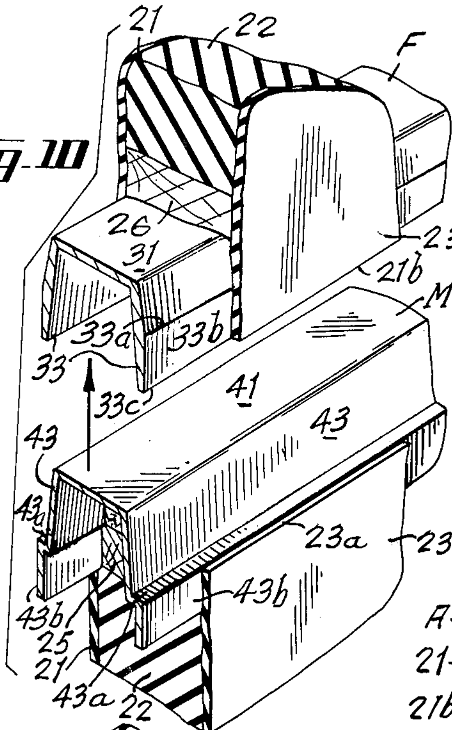
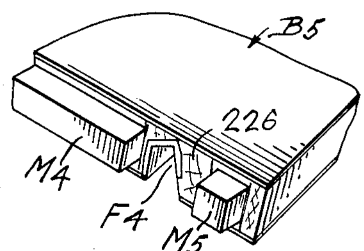


Fig. 10

Fig. 11



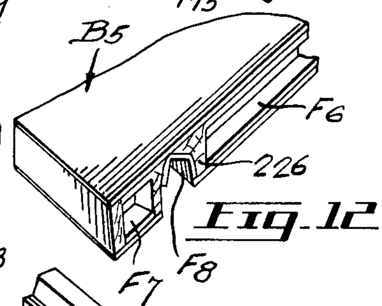


Fig. 12

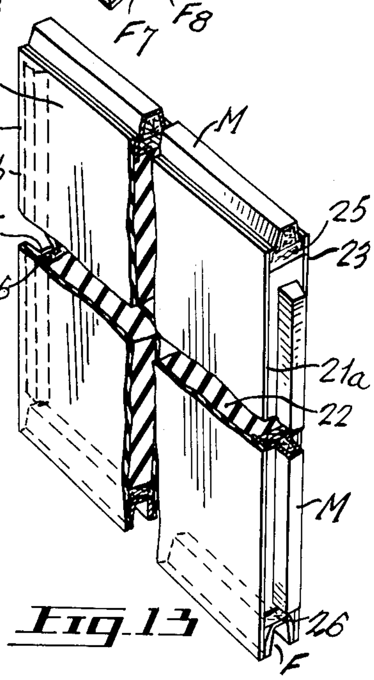


Fig. 13

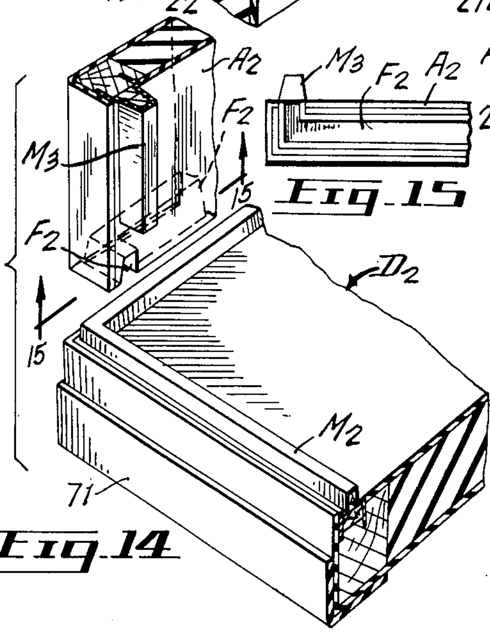


Fig. 14

Fig. 15

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PANEL ASSEMBLY JOINT

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1 Claim. (Cl. 52—270)

BUILDING CONSTRUCTION

This invention relates to buildings in the nature of shelters, huts, camps and other structures normally made primarily from wood.

In erecting buildings of this type, considerable labour is required and the parts including beams, panels and so on are connected permanently and can only be dismantled at the cost of destroying or damaging the structural members. Insulation requires special skill and additional labour to the normal carpentering and other skilled work that goes into making a frame building. Putting up these buildings also requires considerable time.

The applicant has now developed a form of construction which enables buildings for the uses described and others to be erected in a fraction of the time now required and in such a manner that the building can be dismantled quickly and without damage to the structural parts. The insulation is contained within the prefabricated structural members in such a way that no effort is needed other than the normal assembly of the structural members to install the insulation. The structural members are connected by built-in joint parts. Full insulation is, thus, automatically effected as the building is assembled. In this way, the disadvantages mentioned and other disadvantages of prior art methods of construction are avoided and certain positive advantages provided as will become evident from the following description.

THE APPLICANT'S DEVELOPMENT

Briefly, the applicant's construction employs mating structural members in the nature of panels, which are assembled together to form the floor, walls and roof of the building. Each panel has an integral joint component extending entirely or almost entirely about its periphery. More specifically, taking a wall panel for example, four feet by eight feet, the top is provided with a male joint member and the bottom with a female joint member each four feet long, while the sides carry male and female members respectively, eight feet long.

A joint between panels, is formed between a male joint-forming member of one panel and a female joint-forming member of the other panel. The male joint-forming member comprises a tongue which projects from the periphery of the panel made up, in a preferred form, of a blunt wedge-shaped hollow elongated channel member having terminal flanges anchored in the panel, preferably directly inside the facing. In the female joint member, a channel member is countersunk in the body of the panel, preferably with its flanges bonded to the interior of the panel facing members anl the edges of the flanges being coextensive with the edges of the facing. The female channel member is of blunt wedge-shaped internal contour adapted to mate with the male member. In the actual joint, the exposed surfaces of the male and female members are in contact and the ends of the facings of the respective panels abut to form a continuous insulated wall.

The terminal ends of the flanges of the female channel member are coextensive with the ends of the facing and abut a check-shoulder running along the base of the male channel member. The male channel member is filled with insulating material supplementing the insulating material between the facings of the respective panels at each side of the joint. This may be the same insulating member as between the facings of the panel proper and may actually be a continuation of this facing or there may be a stringer intervening the insulating material of the panel proper and the insulating material within the male channel member. There is a completely weather-proof seal at the joint when the panels are mated, there being no direct passage from one side of the panel to the other, but only a circuitous line of contact between the faces of the male and female channel members.

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DETAILED DESCRIPTION

Having generally described the invention, it will be referred to in more detail by the reference to the accompanying drawings, which illustrate preferred embodiments, and in which—

FIGURE 1 is a perspective view of a preferred form of of building constructed according to the invention.

FIGURE 2 is an exploded view, showing various main parts making up the building of FIGURE 1.

FIGURE 3 is an enlarged fragmentary vertical cross-section substantially along the line **3—3** of FIGURE 1.

FIGURE 4 is an enlarged vertical fragmentary transverse cross-section along the line **4—4** of FIGURE 1.

FIGURE 5 is an enlarged fragmentary cross-section along the line **5—5** of FIGURE 1.

FIGURE 6 is an enlarged fragmentary cross-section showing a bolt connection between structural members in the building of the previous figures.

FIGURE 7 is a greatly enlarged cross-section through a joint between wall panels in the building of FIGURE 1 to show the construction more clearly.

FIGURE 8 is an enlarged cross-section through an alternative form of joint.

FIGURE 9 is an enlarged horizontal cross-section along the line **9—9** of FIGURE 1.

FIGURE 10 is an enlarged fragmentary broken view with parts broken away to show the relationship of a female joint member to other components of a panel and a perspective view of a mating male joint member similarly shown.

FIGURE 11 is a fragmentary perspective view showing a panel joint arrangement on the edge of a roof.

FIGURE 12 is a fragmentary perspective view showing a roof joint arrangement adapted to mate with that of FIGURE 11.

FIGURE 13 is a perspective view of a panel which is broken centrally in both directions to reduce its dimensions to fit into the drawing.

FIGURE 14 is a perspective view of a corner of a building of FIGURE 1 with a corner of a panel shown in exploded relationship.

FIGURE 15 is a bottom fragmentary plan view of the wall panel shown in FIGURE 14.

GENERAL ARRANGEMENT

Referring more particularly to the drawings, a building is shown, made up of a number of prefabricated wall panels A, connected to each other and to a number of prefabricated roof panels B, end panels C, and floor panels D set on foundation blocks E. Some of the panels and other parts have been given subscripts, as for example D_2, C_2, etc., to designate panels of special construction, for example, corners, panels, etc., to differentiate them from other panels in the description.

Looking at FIGURE 3, it will be seen that each floor panel D is connected to a wall panel A, by a special joint indicated generally by J and made up of male and female members, as will be described later in detail. Likewise, the roof panels B are connected to the wall panels by a joint J_1 of a similar nature, and which will also be described later in more detail. Similar joining arrangements connect the respective side panels A together, the respective roof panels B and floor panels D. At the corners, special joints J_5 are provided as will be clear from the following description.

Individual panels and their connection

For the purpose of describing the joints, reference will first be made to the structure of a typical panel A, as shown generally in FIGURE 13. The body of the panel A is made up of rigid parallel spaced apart facings **21** and **23** of sheet material intervened by insulation **22**. The facings **21** and **23** extend in each direction between terminal edges **21***a*, **21***b* respectively, which end in male and female joint members M and F respectively.

In the preferred construction shown, the members M and F are hollow channel male and female members (tongue and grooved) of a form to be described. In the construction shown, there are rigid structural members or stringers, in this case, of wood, **25**, abutting the male members M, and **26** abutting the female members F, and intervening the members M and F and the insulation **22**.

The relationship between the panel proper and the members M and F, will best be seen in FIGURE 10, which is a fragmentary exploded view, in which the members M and F are shown in position to be brought together. The member F is an elongated rigid hollow channel having a web **31** and a diverging side flange **33**. In the form shown the channel members are of glass fiber-reinforced polyester. Each flange **33** has a plane inner face and outer faces having a portion **33***b* perpendicular to the web **31**. To this end, the flange **33** thickens from its point of departure from the web **31** to the line **33***a* and then tapers in thickness throughout the portion **33***b*. The faces **33***b* are parallel to the panels **21** and **23** and intimately bonded thereto, with an adhesive. The stringer **26** abuts the web **31** and is connected thereto. The members **21**, **23**, **26**, and the flanges **33** are closely bonded together and the edges **21***b* of the side panels are flush with the edges **33***c* of the flanges **33**.

Turning now to the male joint component, the member M is an elongated hollow channel made up of a web **41** and side flanges **43** which diverge from the web and are stepped as at **43***a* to be provided with terminal cornices **43***b*, having their faces parallel to the panels **21** and **23**. Each cornice **43***b* is juxtaposed to and adhesively connected to the side-panels **21**, **23** and the edges **23***a* terminate flush with the step **43***b*, which serves as a check shoulder. The insulation **22** between the facings **21**, **23** extends up to the flanges **43***b* and a stringer or structural member **25** is located between the cornices **43***a*. The void within the member M between the stringer **25** and the web **41** is filled with insulation, for example rock wool.

The stringers **25** and **26** next to the male and female joints may, if desired, be dispensed with. Then the insulation **22** can extend right up to the webs **31** and **41**, respectively.

The relationship between the edges of respective panels and between the channel members M and F will be readily seen in FIGURE 7, considered in conjunction with FIGURE 10. Considering FIGURE 10, for example, the male and female panels will be brought together with the male member M introduced into the female member F until the mmebers are in the relative position shown in FIGURE 7. The entire exposed inner face of the web **31** and flanges **33** of the member F will come into contact with the exposed outer faces of the web **41** and flanges **43** of the member M. The exposed edges **33***c* of the female member will come into contact with the steps **43***a* of the member M and the ends **21***a* and **21***b* of respective panels A will abut. Nails or screws may be run through the stringer **25** or **26** and the flange of the member M or F, at intervals, for additional stability.

In this way, a joint is formed in which there is no direct passage from one side of the resulting panel to the other, only a circuitous point of contact between the sur-

faces of the members M and F. Insulation **27***a* in the male member intervenes that would normally be a direct line through the joint.

An alternative form of panel joint is shown in FIGURE 8. The difference here is that the wall is somewhat thicker than the actual joint members so that the female member F is actually embedded in a rigid stringer **126**, whereas the lower part of the flange **143***b* in the male member M, is embedded in the member **125** rather than being connected to the facings **21** and **23**. This is accomplished by preslotting the stringers **125** to receive the flanges **143***b* and inserting the latter, with adhesive applied to complete the connection. To accommodate the member F, the stringer **126** is provided with a groove into which the member F is adhesively secured.

Corners

A typical corner construction between wall and floor panels A_2 and D_2, respectively, is shown in FIGURE 14. Here a typical male joint member M_2 of floor panel D_2 enters a female joint member F_2, forming a part of the panel A_2. The members M_2 and F_2 are anchored to the respective panels in a manner clear from the description and drawings. The corner joint is made between the male member M_3 on the panel A_2 and a mating female member on a panel C_2 (not shown in FIGURE 14). The female joint member F_2 of the wall panel A_2 turns the corner, as shown in FIGURE 14, and in the bottom plan view of FIGURE 15.

Roof-wall connection

A typical roof-wall joint is shown in FIGURE 3 as J_1 and in further detail in FIGURES 11 and 12. The structure of the roof joint is similar to that of the wall panels, except that the female member F_4 is eccentrically set in a longitudinally extending stringer **226** of the roof. Respective roof panels B_5 are connected together as shown in FIGURES 11 and 12. The male joint is made up of a male member M_4 and a short-male member M_5, which is really a continuation of M_4, but leaving a gap to accommodate F_4. Likewise, the mating panel B_5 is provided with female members F_6 and F_7 mating with the male members M_4 and M_5 respectively and a member F_8 adapted to form a continuation of F_4.

The member M_5 need only be a block and the member F_7 a receiving pocket, although these members can be of the same preferred construction as the male and female members M and F, if desired.

At each end of the roof the panels B_6 are slightly larger and provided with a longitudinal groove, similar to the wall panels to mate with outstanding male joint of triangular end panels C_3 and C_4 forming the upper part of end wall C.

Roof construction

The construction at the ridge of the roof, showing how panels B, at either side of the roof are joined together, is best seen in FIGURE 4. The roof panels B abut in sloped edges **51** of beams **55** bordering the panels B and the joint thus made covered by a plate **53**. The panels B are held by bolts **53** which extend through the beams **55** to engage in suitable tapped sockets in twin ridge pole members **57**, which can extend the entire length of the roof. These members **57** can be made up to suit buildings of different lengths. The members **57** are clamped together in a lateral direction by bolts **61** and also through U-shaped metal brackets **59**, each of which is held to a truss T, as shown. This structure holds the truss in place, at the centre of the building. Each end of the truss is held in a bracket **62**, which is bolted to a side wall panel A and to a roof panel B, as shown. There is a truss about every two panels in a typical construction, i.e. about every 8 feet. This structure rigidifies the roof and keeps it from sagging in the centre.

Materials

The materials from which the various components of the building may be made can vary. For example, the panels A, B, C, etc., are faced with relatively thin facings **21** and **23**, of material, which may be plywood, metal, or any other impervious sheet material. The insulating material **22** may be foam insulation, that is, synthetic resin foam, raw wool or other insulating material, as will be understood by one skilled in the art. The insulating batt **27***a* within the male members M may be the same as the insulation **22**. Where the male member M abuts a stringer **25**, it may be more convenient to use a wool-like material to pack the hollow channel M. The stringers **25** and other massive joint components may be of wood. Various connecting parts are shown, for example, bolts, etc., which are best of metal and the roof cap **53**, preferably of glass fiber polyester resin sheet material, as is the molding **71** about the bottom edge of the building. However, these members can be of metal or other suitable material. The male and female members M and F are preferably of molded glass fiber polyester construction. The flanges of these members are bonded to the facing members **21** and **23**, or other facing members or within the groove of the stringers **125** and **126** by suitable adhesive, for example, an epoxy resin.

The joints in the floor are preferably staggered in relation to the joints in the wall so as to avoid having a continuous joint in one particular location in the building.

Erection of components

The erection of the building is quite simple, as will be understood by one skilled in the art. The panels are merely brought together in the relationship shown and described and the male and female joint members mated and adhesively secured together and the structural clamping, bracing, or reinforcing metal members applied where desired. If the building designed is to be dismantled, the joint members need not be held together by permanent adhesive, but their mere mating together is effective to hold the building in erected condition with removable tie bolts or other securing members securing key parts together. The outside of the joints can be taped with adhesive tape G, if desired, for example, where extremely high velocity winds are encountered, but this is usually not necessary.

Advantages

A building erected with panels of the preferred form described, withstand winds of one-hundred-miles per hour with no apparent penetration of drafts. The building requires a minimum of screws, nuts or bolts since actually cooperation between the male and female joint members retains the prefabricated panels in place and prevents them from displacement. The facings of the panels can be painted so that no painting of the erected building is required.

I claim:

A building, comprising, a floor, walls, and a roof, each made up of a plurality of abutting sections, each floor section being provided with an upwardly extending marginal wedge-shaped protuberance thereby to form a continuous convex ring round the entire periphery of the floor, each roof section being provided with a concavity complementary to the shape of said protuberance thereby to form a continuous concave ring round the entire periphery of the roof, each wall section being provided with a wedge-shaped protuberance similar in shape to that extending upwardly from the floor section at its upper end thereby to form a continuous convex ring at the top

of the wall equal in length and fitting into the complementary ring in the roof section, each wall section having a concavity at its bottom margin thereby to form at the bottom of the walls a continuous concave ring of the same length as the continuous convex ring of the floor complementary thereto and receiving it, each wall section having a wedge-shaped protuberance at one end and a concavity complementary to the shape of said protuberance at the other end, each fitting into a complementary part on an adjoining section, the interlocking of the respective convex and concave rings and the protuberances and concavities locking the sections together, the protuberances being shaped to be received endwise in a snug fit by the concavities, each wedge-shaped protuberance being formed of an elongated symmetrical one-piece male channel member comprising a web provided with twin flanges extending from the sides thereof at an outwardly diverging angle, said flanges being stepped outwards beyond an initial major part to include a terminal cornice perpendicular to said web and a step having outer and inner surfaces parallel to the web between said flange and said cornice, and each complementary member comprising a symmetrical one-piece female channel member comprising a web and a pair of outwardly diverging side flanges each having a plane inner face and a thickness which increases from the intersection of said web and each of said diverging side flanges to a maximum and then decreases to a minimum at the outer extremity of said flange presenting therebetween a channel receiving the male protuberance of the next adjacent section, the flanges of the female channel member terminating in straight edges abutting the steps of the male channel member of said next adjacent section.

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