Dec. 9, 1952 W. BRAUER 2,620,651

PREFABRICATED BUILDING STRUCTURE

Filed July 8, 1946 4 Sheets-Sheet 1

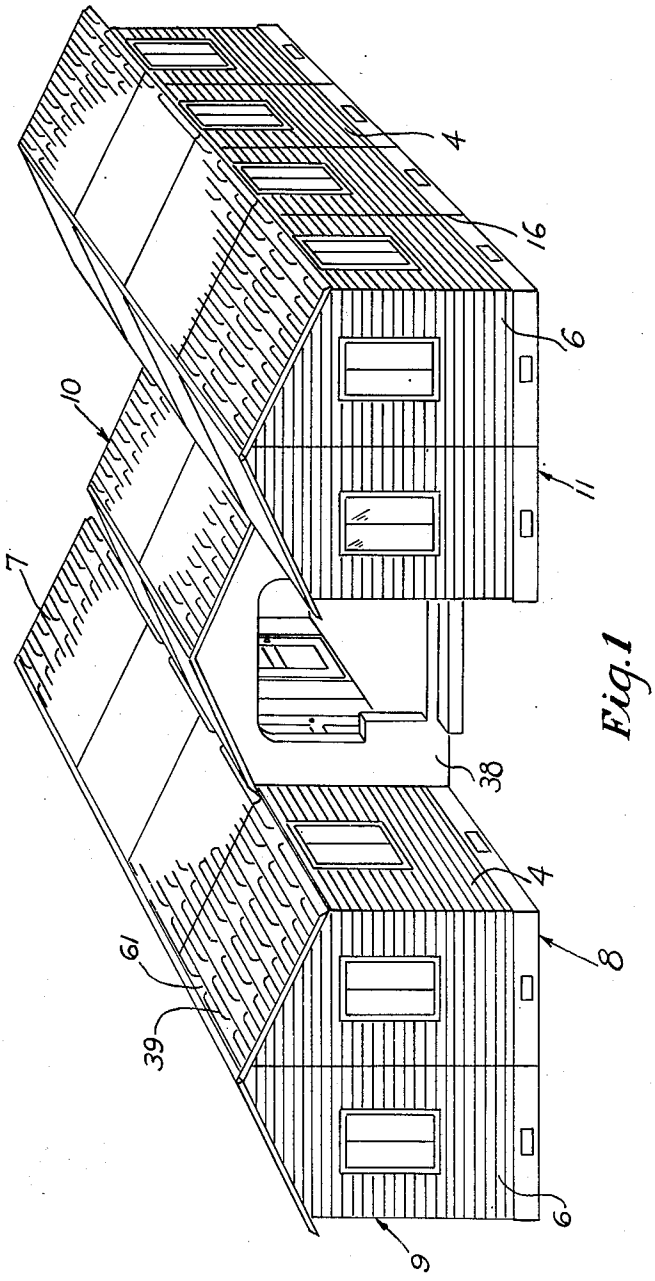


Fig. 1

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PREFABRICATED BUILDING STRUCTURE

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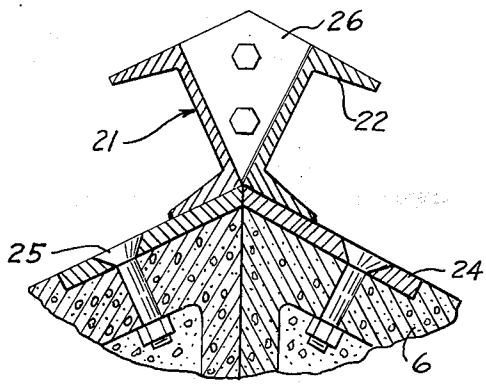


Fig. 2.

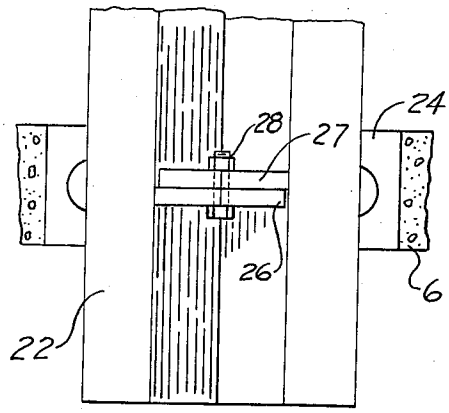


Fig. 3.

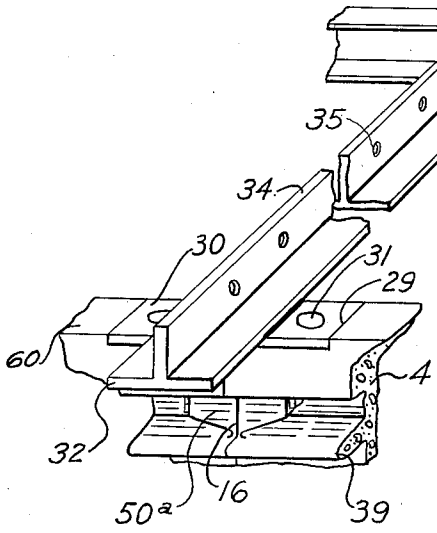


Fig. 4.

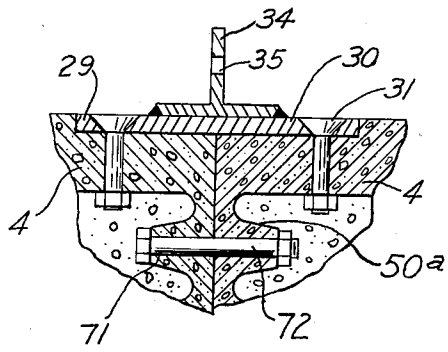


Fig. 5.

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PREFABRICATED BUILDING STRUCTURE

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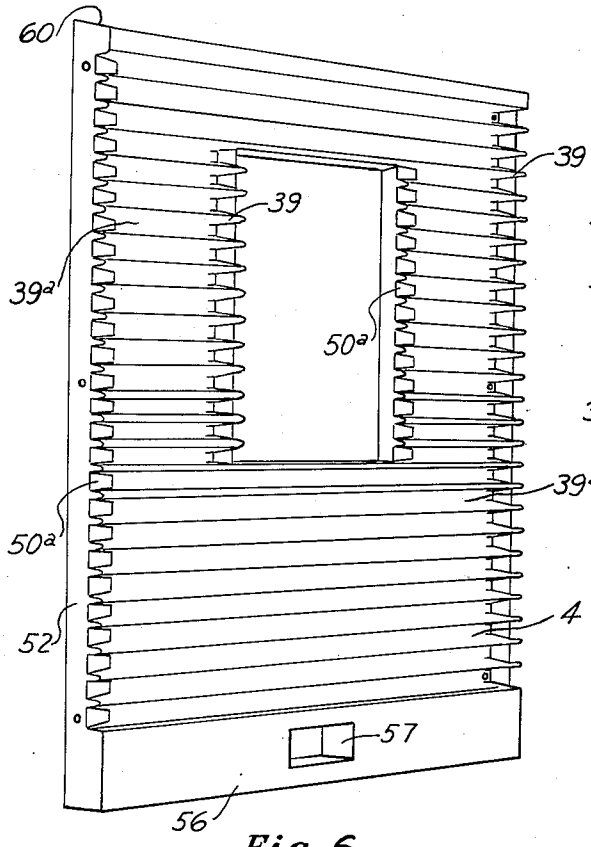


Fig. 6.

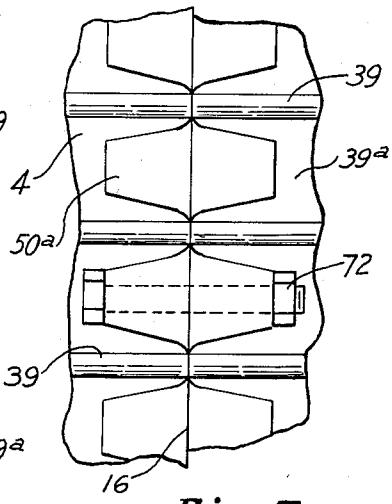


Fig. 7.

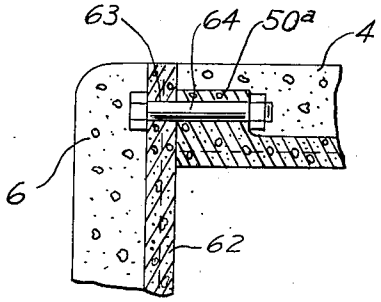


Fig. 8.

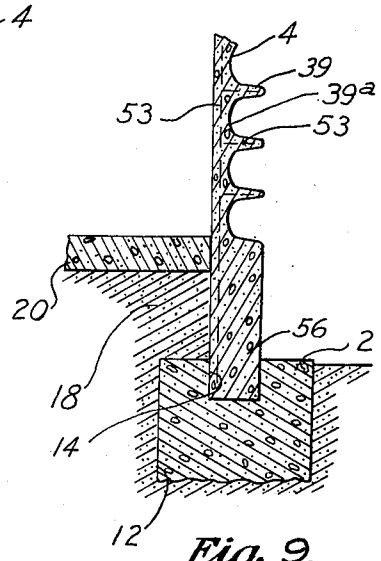


Fig. 9.

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PREFABRICATED BUILDING STRUCTURE

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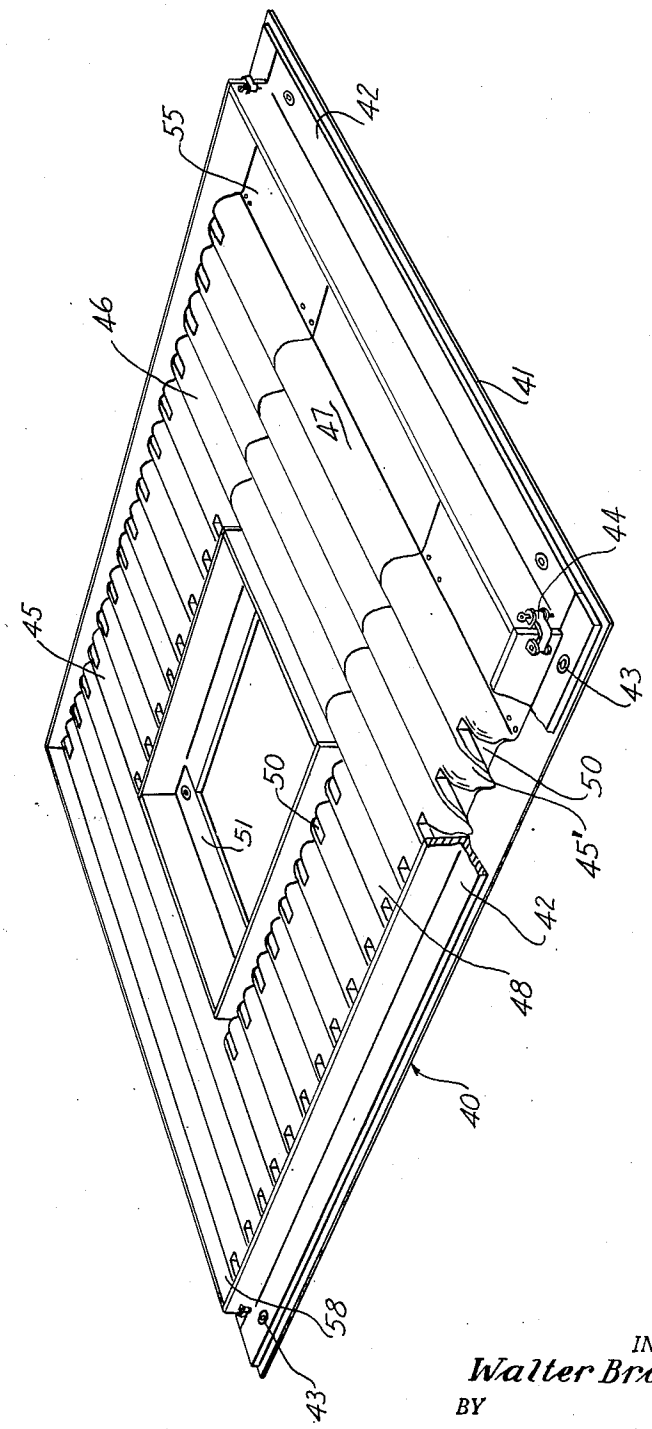


Fig. 10

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UNITED STATES PATENT OFFICE

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PREFABRICATED BUILDING STRUCTURE

Walter Brauer, Ingleside, Tex.

Application July 8, 1946, Serial No. 681,839

2 Claims. (Cl. 72—16)

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This invention relates to building construction, and more particularly, but not by way of limitation, to prefabricated concrete structures and a method of making the same.

The present invention contemplates the construction of a building or house from lightweight concrete wall and roof sections all of substantially standard dimensions, the elements of which are produced at a central location and then assembled at the house site in order to reduce production cost and the overall expense of the structure.

It is an important object of this invention to provide a method of forming building structures of lightweight sections constructed in such a manner to provide a self-shading aspect to the whole structure.

A further object of the invention is to provide a building structure employing pre-cast sections of cementitious material which are capable of being assembled as a unit at the desired location of the structure, it only being necessary to provide the foundation and floor.

And still another object of this invention is to provide a method of erecting a building structure from pre-cast wall and roof slabs of cementitious material formed with radially extending fins to provide a shaded air pocket for the body of the slabs, thereby providing a self-shading feature for the whole structure. Furthermore, the radially extending fins assist in providing a lighter and stronger slab construction throughout.

And still another object of this invention is to provide a method of constructing a housing or the like from prefabricated slabs of cementitious structure which includes steel reinforcements to provide an inexpensive construction of substantially welded steel and reinforced concrete that is substantially fireproof, rat and termite proof.

Other objects and advantages of the invention will be evident from the following detailed description, read in conjunction with the accompanying drawings, which illustrate my invention.

In the drawings:

Figure 1 is a perspective view with specific details omitted for clarity of one type of the complete building structure as erected.

Figure 2 is a detailed view in sectional elevation of the roof truss.

Figure 3 is a detailed top view of the roof truss.

Figure 4 is a perspective view partially in plan of the connecting T-beam between the roof truss and the wall sections.

Figure 5 is a sectional view in detail of the welded joint between the T-beam and the saddle plate.

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Figure 6 is an elevational view in perspective of a wall section.

Figure 7 is a detailed view in elevation of a wall section joint.

Figure 8 is a sectional view in detail of the connecting joint between a side wall section and an end wall section.

Figure 9 is a detail in section showing a wall section disposed in the foundation.

Figure 10 is a view in perspective of the form used for casting the wall sections.

Referring to the drawings in detail, and more particularly Figures 1 and 9, reference character 2 represents a foundation for supporting the side wall sections 4, end wall sections 6 of the building structure 8 as will be hereinafter set forth. The plurality of pre-cast side wall sections 4 and end wall sections 6 and room sections 7, the construction of which will be hereinafter set forth, are assembled and bolted together on the foundation 2 to form the complete structure 8.

Referring to Figure 9, the foundation 2 is formed by digging a ditch or trench 12, substantially rectangular in shape, for receiving concrete. A special jig (not shown) is provided in casting the concrete foundation 2, in order to form a recess 14 therein. The jig is used in order that the recess or groove 14 will be level and straight throughout the foundation, thereby assuring proper alignment of the wall and end sections as will be hereinafter referred to. After the concrete foundation 2 has set, the side wall sections 4 and end wall sections 6 are disposed in the groove 14, being arranged in place by any conventional means such as a crane or a hoist, operating from a truck (not shown). Beginning at a corner of the house the wall sections are laid in juxtaposition to each other, in order to be bolted together at their joints or contiguous edges 16, as will be hereinafter set forth. With the wall and end sections assembled and bolted in proper relationship, the foundation groove 14 acts as a seat. The space inside the wall and end sections is filled with dirt and gravel 18 a few inches above the ground level as clearly shown in Figure 9. This acts as a support for the concrete floor 20 poured thereupon. It will be apparent that prior to the pouring of the concrete floor 20 that any water, gas, electric, or sewer, or other conduits, may be disposed on the dirt floor 18 prior to the pouring of the floor 20.

Referring to Figure 1, the building structure 8 comprises three sections forming the layout of the house. The sections are designated as 9, 10, and 11. However, it will be apparent that the

structure is not limited in any manner to the type of architectural layout disclosed in Figure 1, but may be varied to different types of architecture (not shown). Furthermore, it will be apparent that any variation of layout may be constructed as desired within the teachings of this invention, and the dimensions of the various rooms or number of rooms are flexible. With a skeleton structure set up by the disposition of the wall and end sections in the foundation groove 14, it is necessary to provide a roof truss between the two end slabs 6 for any of the sections 9, 10, or 11.

Referring to Figures 2, 3, and 4, a roof truss 21 comprising a pair of steel channel irons 22 is supported at the topmost portion of a pair of adjoining end sections 6, as is shown in Figure 2. The topmost portion of the end wall sections 6 are cast with a counter-sunk recess 23 for receiving a steel saddle plate 24 held therein by bolts 25. The roof truss 21 extends longitudinally the complete length of a section of the house between any two upright end wall sections. The channels 22 are inter-connected by a pair of plates 26 and 27, secured together by bolts 28. From Figure 3 it will be noted that the plate 26 is welded to the left-hand channel 22, while plate 27 is welded to the right-hand channel. A pair of these connecting plates are preferably spaced and welded along the channels at approximately three-foot intervals, thereby providing a completely assembled roof truss inter-connecting the end wall sections for any section of the house, as desired.

Referring to Figure 4 at the adjoining edges 16 of the wall sections 4, the topmost portion of each of the wall sections 4 is provided with a counter-sunk portion or recess 29 for receiving a steel saddle plate 30 secured in the recess by the bolts 31. Furthermore, the topmost portion or ridge 60 of each of the wall sections is formed with a taper or pitch (as will be hereinafter set forth), conforming to the pitch of the roof. At a point in alignment with the adjoining edges 16 of any two wall sections, a steel T-beam 32 is welded at one end to a channel 22 with the opposite end disposed on a saddle plate 30 and welded thereto. The T-beam 32 overhangs the edge of the wall sections 4 for a purpose, as will be hereinafter set forth. It will be apparent from Figure 1 that a plurality of T-beams are disposed between the roof truss 21 and the top of the wall sections 4 for any one section of the house. Furthermore, these T-beams are disposed on both sides of the truss 21, and the number is variable according to the dimensions of the particular section. Additional strengthening ribs (not shown) may be secured between a T-beam 32 and a channel 22 in order to add strength, and also eliminate the possibility of shearing the welded connection there-between. At this point the structure may receive the roof sections 7 adapted to be disposed between the horizontal leg 33 of the beams 32 between the adjoining edges 16 of the wall sections 4. The upstanding leg 34 of the beam is provided with a plurality of the apertures 35 in alignment with apertured projections to be hereinafter set forth provided with the roof sections in order that they may be bolted to the leg 34 of a beam 32.

From the foregoing it will be apparent that each of the building sections 9, 10, and 11 can be formed in substantially the same manner. However, referring to Figures 1 and 2, the porch or breezeway section 10 is formed by utilizing one side of the wall sections 4 of the building sections 9 and 11 as a portion thereof. The end wall porch sections 38 are formed with a projecting vertically disposed steel flange (not shown) and provided with a plurality of vertically spaced apertures so that the flange may be disposed between the contiguous edges 16 and be bolted between the wall sections 4 in a manner as will be hereinafter referred to. It will be obvious that the dimensional length of the porch will determine the adjoining edges 16 that the flange may inter-fit.

Figure 6 discloses a pre-cast side wall section having outwardly projecting radially disposed fins or ribs 39 providing a plurality of vertically spaced grooves or elongated recesses 39a therebetween. Figure 10 discloses the form 40 for casting wall sections and comprises a flat steel base 41 of any desired dimensions upon which are disposed a plurality of angle irons 42, arranged adjacent to the outer edge thereof. The angle irons 42 are kept in proper alignment relative to the plate 41 by dowel pins 43. Furthermore, they are interlocked at the corner by means of latches 44 to provide a collapsible knockdown form. A plurality of light gauge sheet metal molds 45 are disposed on the plate 41 within the confines of the angle irons 42. The sheet metal molds 45 are formed with wavy or undulated portions 45' properly dimensioned in order to cast or form the radial fins 39. The plurality of sheet metal molds 45 may be formed of three sections 46, 47, and 48, wherein sections 46 and 48 can be telescoped on section 47 in order to vary the width of the mold within the confines of the angle irons 42. This assures precision alignment of the outer side edges of the molds in order that a substantially accurate edge may be provided. This is quite essential for the alignment of the contiguous edges 16 of the wall sections for bolting, as will be hereinafter set forth. While the dimensions of the wall or like sections are variable, it will be apparent that the telescoping arrangement of the molds 45 provides for variations in the width for the cast slabs. Once the molds 45 are set for the proper dimensions relative to the angle irons 42, they may be secured by any suitable means (not shown) to the base plate 41. Furthermore, the telescoping feature provides for elimination of a portion of the center section 47 of the molds in order to receive a window frame 51 of any desired size. It will be apparent that any suitable door frame could be similarly provided. The window frame is preferably steel and formed with a slight taper for a purpose as will be hereinafter set forth.

The outer side edges of the molds and the edges adjacent to the window frame are formed with a plurality of cutaway portions or cavities 50, which when filled with concrete provide projections 50a (Figure 6) between the radial fins 39, for a purpose as will be hereinafter set forth.

Referring to Figure 9, the wall section 4 comprising the radial fins 39, and solid slab 52 are shown with reinforcing wire 53. This wire may be placed in the molds 45 between the bent sections 45' forming the fins by merely bending and placing therein prior to pouring the concrete. Any suitable heavy reinforcing wire may be used. With the form set up as shown in Figure 10, the concrete is poured from any suitable means, such as a traveling conveyor receiving concrete from a mixer (not shown) and poured into the forms 45 until all of the cavities are filled up with the concrete mixture. The mix-

ture is poured substantially flush with the top of the angles 42, thereby providing the solid slab 52 of the wall section 4. It will be apparent that the thickness of the black slab may be variable, depending on the amount of pour in relation to the height of the angle bars 42. It is preferable, but not limited thereto, to utilize a cellular structure of lightweight porous aggregate in lieu of the ordinary gravel in the concrete mixture, thereby providing a reduction in weight as well as providing for better insulation properties. After the concrete mixture has been leveled and smoothed on the top surface, it is allowed to set for approximately 24 hours before it is removed from the form. It is removed in any conventional manner by unlatching angle bars 42, and placing hoisting clamps (not shown) along the outer side edges of the cast slab and lifted by a hoist (not shown) to any suitable curing rack to be cured for a short period of time. Alluding further to the form 40, it is noted that a space 55 is provided without the bent molds 45 in order to form a concrete base 56 on the wall sections. It will be apparent from Figure 9 that a jig or core may be placed in the space 55 to provide the aperture 57 adapted for receiving an air ventilator providing air communication with the fill 18 beneath the concrete floor 20. In addition to allowing for circulation of air, the apertures 57 also act as an outlet for any water that may collect in the fill. In casting the side wall sections 4, a special jig (not shown) is placed in the space 58 adjacent to the top angle iron 42 in order to provide for the counter-sunk portions 29 and the inclination 60 of the top web of the side wall section 4, in conformity with the pitch or incline of the roof.

From the foregoing it will be apparent that the form 40 is utilized to cast the side wall slab section 4 as shown in Figure 6. Furthermore, it will be obvious that the overall dimensions of the wall section may be made variable to any size desired. However, all the side wall sections are preferably of standard dimensions for a particular house. The method of casting the end wall sections 6 is identical with that of the side wall section 4 except that the top most angle iron 42 is arranged at an angle or inclination in conformity with the pitch of the roof. It will be apparent that the steel slab 41 and one of the side angles 42 will be of greater dimensions in order to provide the obtuse shape for the end wall section 6. In like manner the roof sections 7 are cast from a form of similar construction; however, the undulated portions or crevices 46 are formed at a slight angle to the vertical in order to provide radial fins for the roof sections 7 which incline at an angle for a purpose as will be hereinafter set out. Furthermore, the sheet metal mold 45 in the form for casting the roof sections is set up to allow for cutaway portions 61 (Figure 1) between the fins, in order that water may be drained from the roof. The overhanging of the T-beams assists this drainage.

It will be apparent that only two sets of forms or molds are required in order to cast all of the necessary sections to erect the building structure 8. The form for the side wall sections, as shown in Figure 10, and modifications (not shown) of this form heretofore mentioned for the end wall sections and the roof sections, are within the teachings of this invention. Furthermore, one side edge portion of the end wall sections 6 is cast to eliminate the outstanding projections 50a normally between the radial fins. As shown in Figure 8, the solid slab portion 62 of the end section 6 along this edge is provided with drilled apertures 63 receiving bolts 64 and cooperating with an apertured projection 50a, on side wall section 4 for bolting an end wall section to a side wall section at the corners of the structure 8. The radial fins or ribs 39 provided on the end, side and roof sections, preferably but not limited thereto, extend outwardly approximately three and one-half inches from the solid portion of the section and are preferably spaced about four inches apart to provide an essential feature of the invention. Furthermore, the projections 50a extend outwardly from the solid portion of the sections but at a less distance than the fins 39. It will be apparent from Figure 6 that the rib wall construction will form shaded air pockets on the outside or exterior of the wall portions similar to a cooling fin principle. This is particularly noted in Figure 9. Consequently, for a house facing north or south, the sun can only contact the east wall of the structure for one or two hours early in the morning, and the west wall of the structure for a few hours late in the afternoon. In the meantime, the fins 39 provide a shaded area for the solid slab portion in the space 39a between the fins. It is preferable, although not limited thereto, to cast the fins on the wall sections to run in the same direction as the roof ridge or truss 21 for a particular building section. Furthermore, the inclination or angular disposition of the fins 39 for the roof sections 7, Figure 1, is such that the fins on the east side of the roof will be angled in a direction away from the sun, while the fins on the west side relative to the roof truss will be angled in an opposite direction, thereby providing a shading for a portion of the roof in the morning as well as a similar shading for the remainder of the roof in the evening.

With a sufficient number of the side wall, end wall, and roof sections pre-cast, the house may be erected as heretofore mentioned, starting by placing the side wall and end wall sections in the recess 14 of the foundation 2. The projections 50a between the fins 39 are provided with bolt holes 71 (Figure 5) for receiving locking means 72, such as a bolt and nut for securing the contiguous edges 16 of the side and end wall sections together. In similar manner, the roof sections 7 are provided with the apertured projections 50a in alignment and cooperating with the apertures 35 of the T-beams 32 and receiving suitable locking means (not shown) for securing the roof sections between the T-beams. The apertures 71 may be formed in the projections 50a by placing a core or the like in the cavities 50 during the casting. However, it has been found more expedient to drill these holes from the solid projection 50a after the slabs have been cast. Figures 4 and 7 are good illustrations of the connection between the contiguous edges 16 of any of the sections.

With the house erected as shown in Figure 1, all the joints 16 between the wall sections and roof section are caulked and grouted with a cementitious compound to provide weather stripping against the elements. Furthermore, both the exterior and interior of the wall sections may be painted with a cement, lime, and water mixture, colored as desired to enhance the appearance of the house. The T-beams 32 in extending over the edge of the wall sections allow for water drainage through the recess 61. Furthermore, it will be apparent that suitable drain spouts may be attached to the edges of the roof

sections, if desired. Windows and doors may be installed after the house is erected.

From the foregoing it will be apparent that the present structure provides a house formed from lightweight concrete wall and roof sections cast with cooling fins on their outside surfaces in in order to shade the solid portions of the wall and roof sections between the fins from the direct rays of the sun, and produce shaded air pockets between the radial fins so that the inner wall portion of the pre-cast slabs will have a temperature lower than that of the outside air temperature. The cooling feature is greatest during the middle or warmest part of the day. The radial fins **39** are heated by the sun's rays but return this heat to the outside air by radiation and convection, leaving the inner solid slab portion **52** much cooler. The structure is of entirely welded steel and reinforced concrete aggregate construction with the exception of the doors, windows, and partitions. The pre-cast slab sections can be formed at a central location in numbers necessary to erect any one structure and transported to the site of erection. In this manner an economical unit can be provided as well as expeditiously erected.

Changes may be made in the specifications and drawings without departing from the spirit of the invention within the scope of the following claims as set forth.

What I claim is:

1. In a building structure comprising a plurality of individual structural slabs arranged in edge to edge relationship, a plurality of vertically spaced outwardly extending fins provided on the outer surface of the slabs, a plurality of grooves provided between the fins, aligned projections provided in the grooves and disposed at the edges of said slab, an aperture in each of the projections, bolt means extending through apertures of abutting projections to connect the slabs in edge to edge relationship.

2. In a building structure comprising a plurality of pre-formed individual structural slabs arranged in edge to edge relationship, a plurality of vertically spaced outwardly extending fins provided on the outer surface of the slabs and extending horizontally thereon, a plurality of grooves provided between the fins, aligned projections provided in the grooves and disposed at the edges of said slabs, an aperture in each of the projections, and bolt means extending through the apertures of abutting projections to connect the slabs in edge to edge relationship.

WALTER BRAUER.

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