

Nov. 10, 1964

J. H. SLAYTER

3,156,018

PLANT-MANUFACTURED BUILDING STRUCTURE

Filed Dec. 21, 1961

9 Sheets-Sheet 1

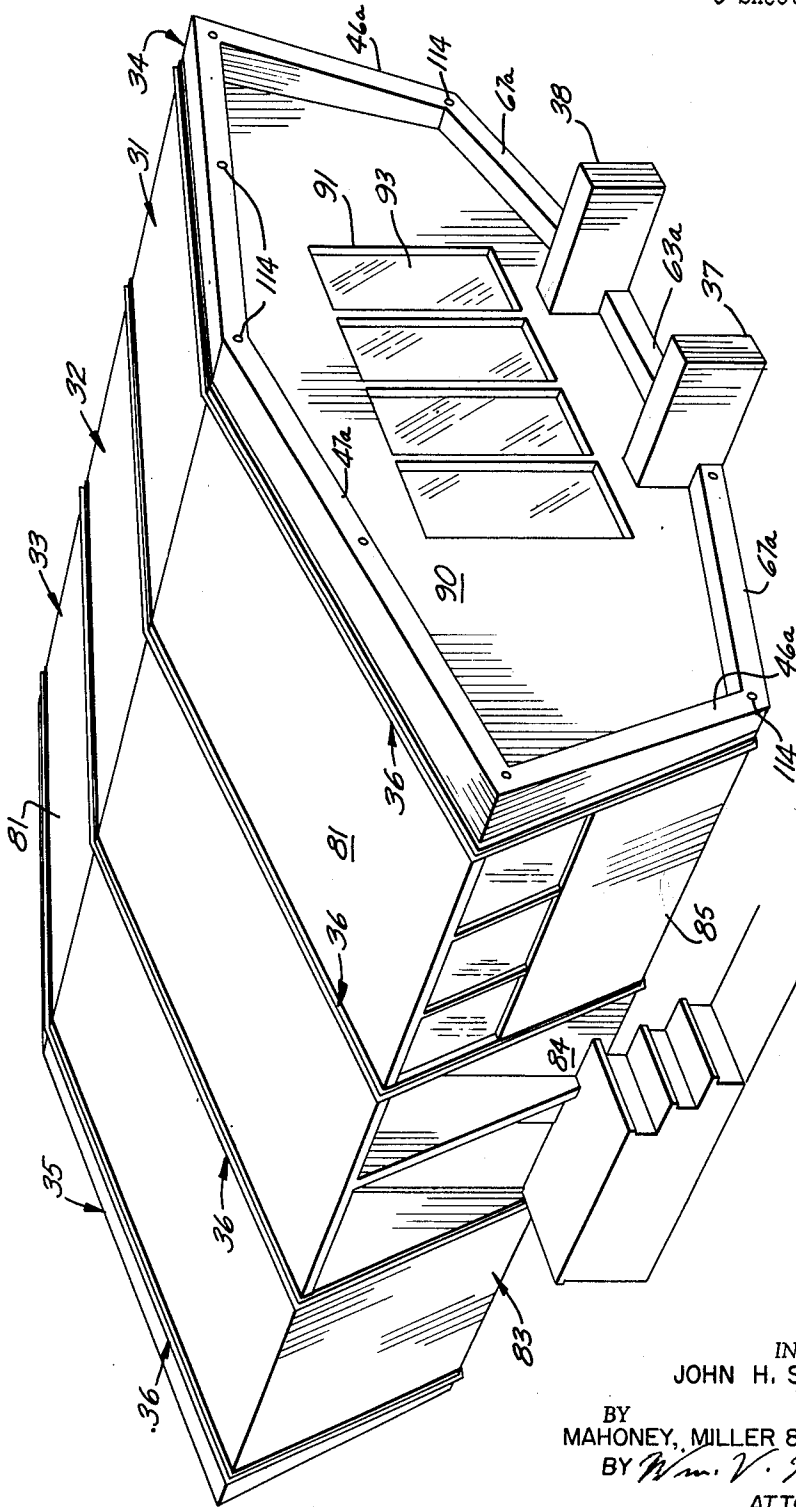


FIG. 1

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9 Sheets-Sheet 2

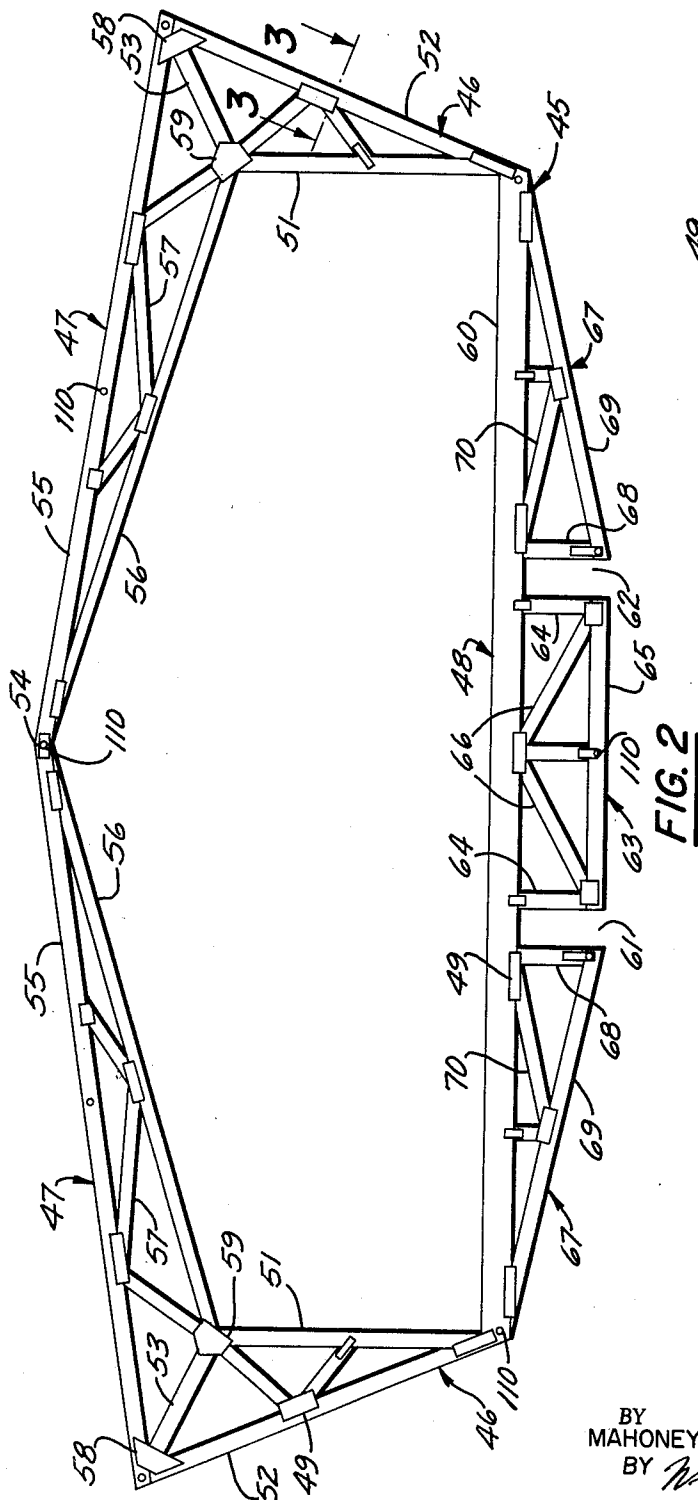


FIG. 2

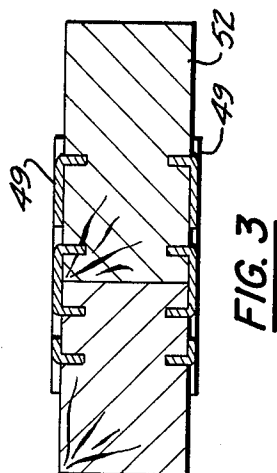


FIG. 3

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9 Sheets-Sheet 3

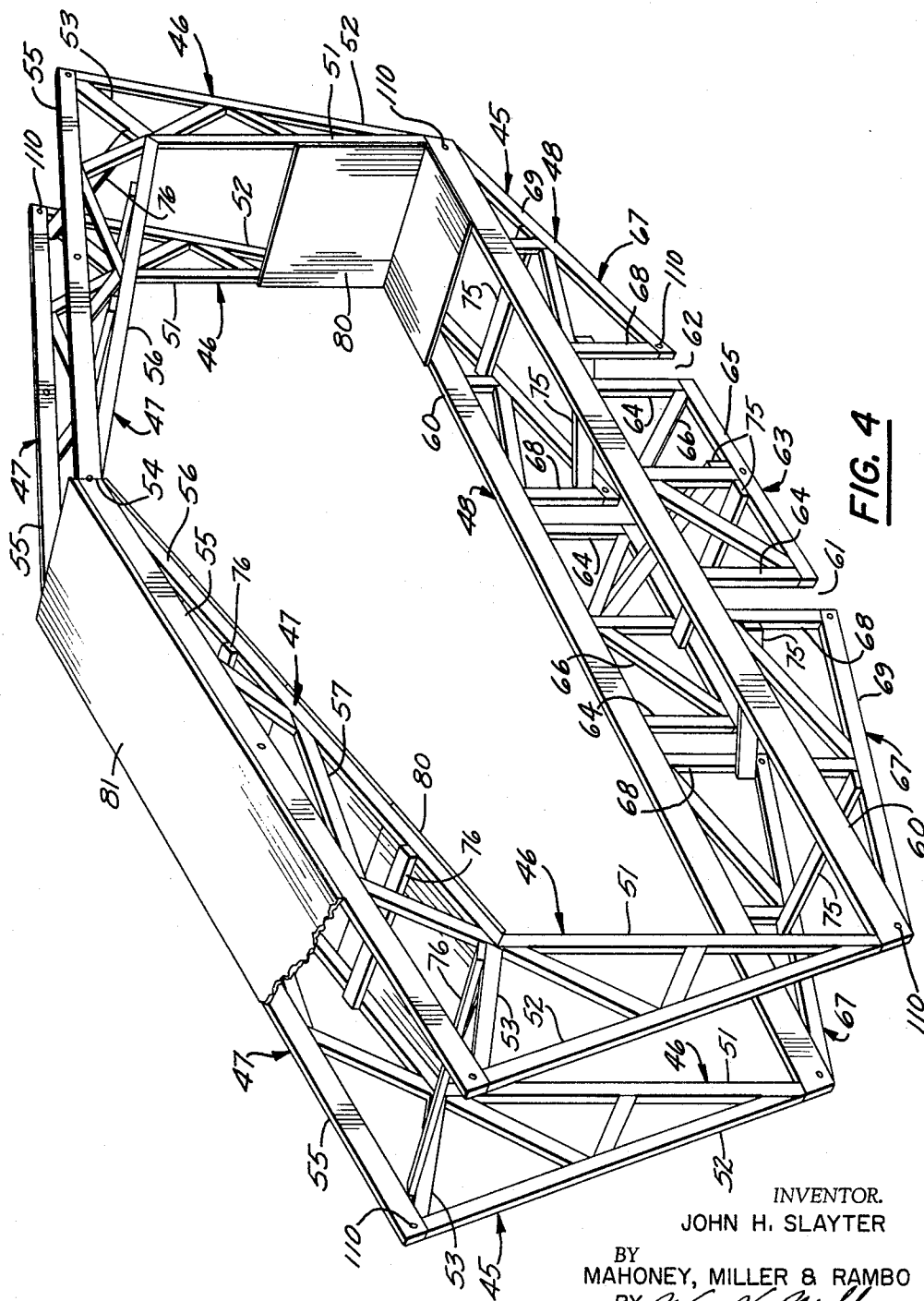


FIG. 4

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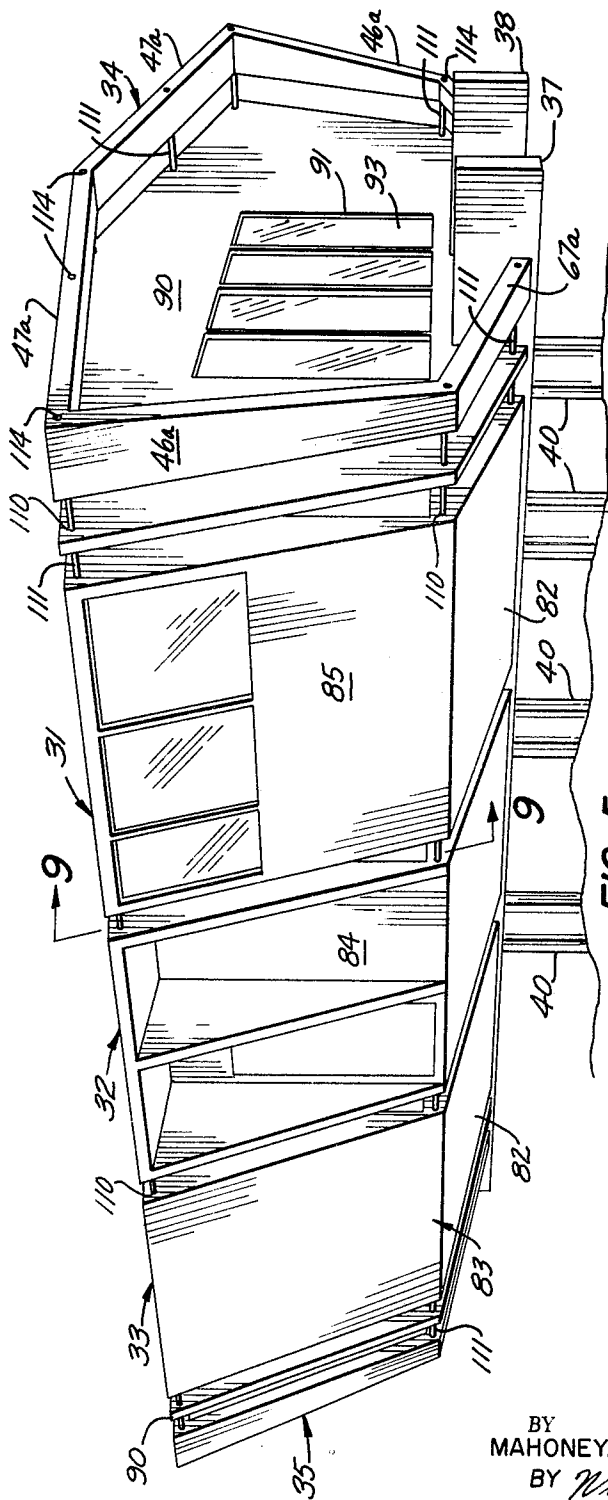


FIG. 5

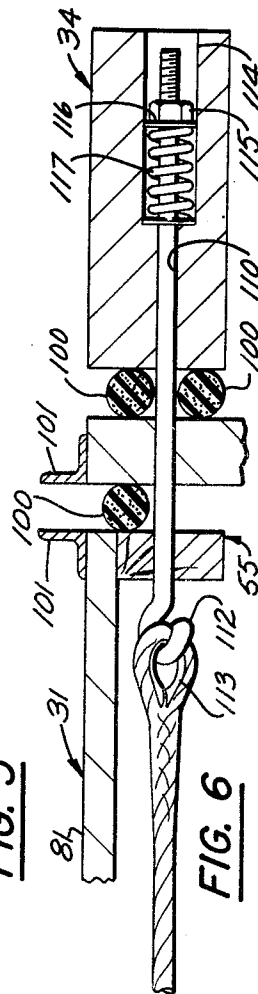


FIG. 6

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9 Sheets-Sheet 5

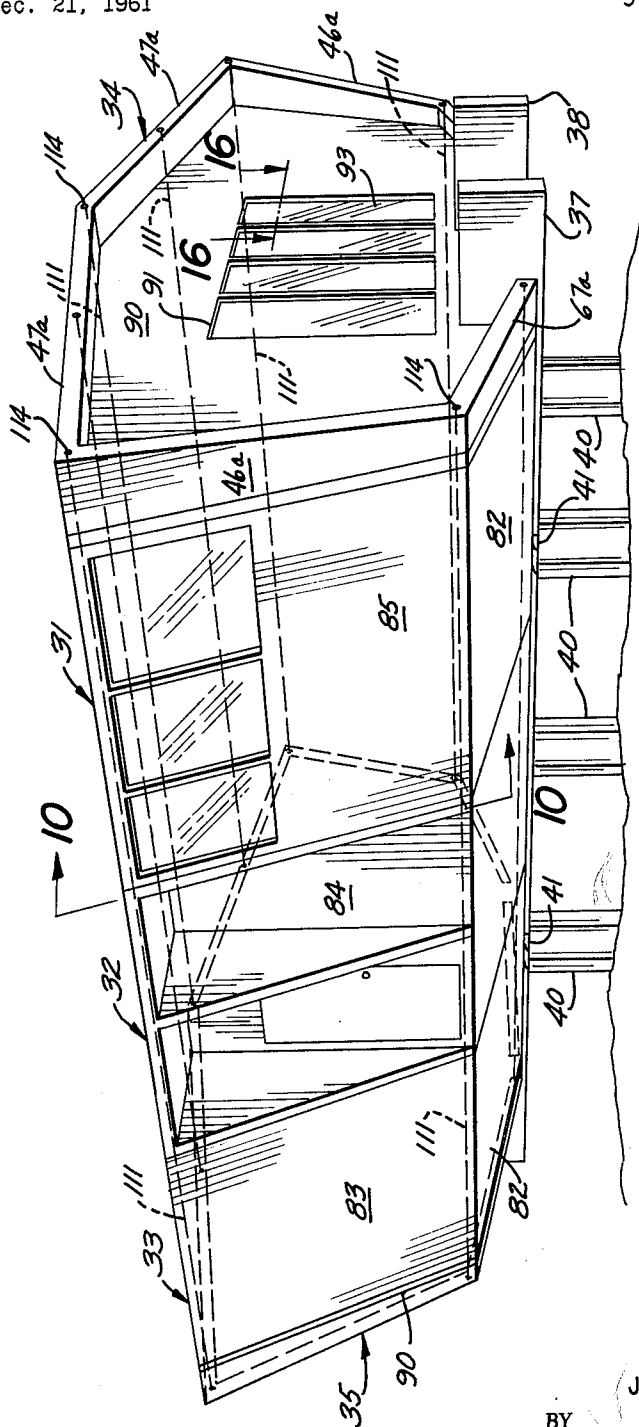


FIG. 7

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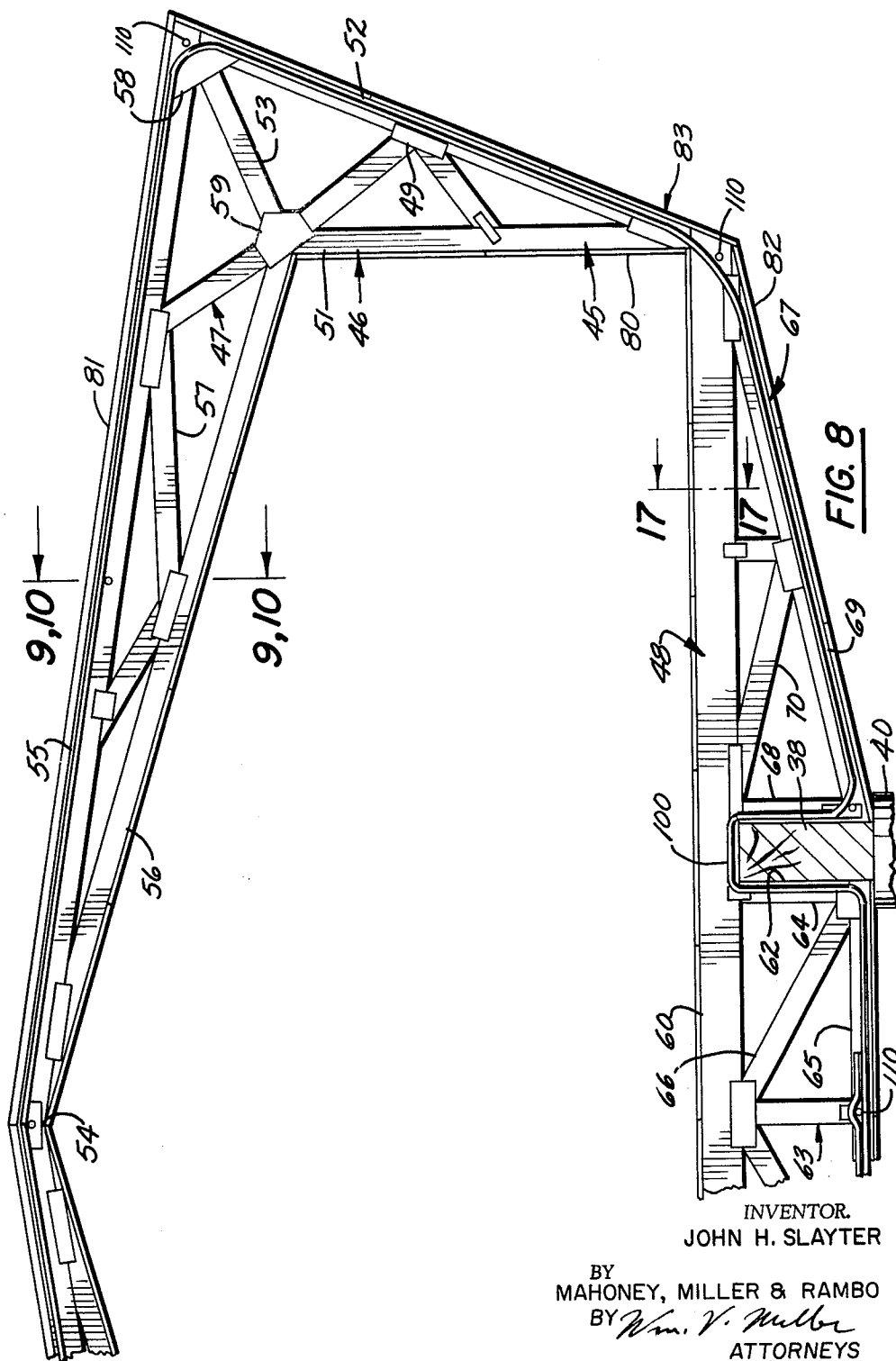
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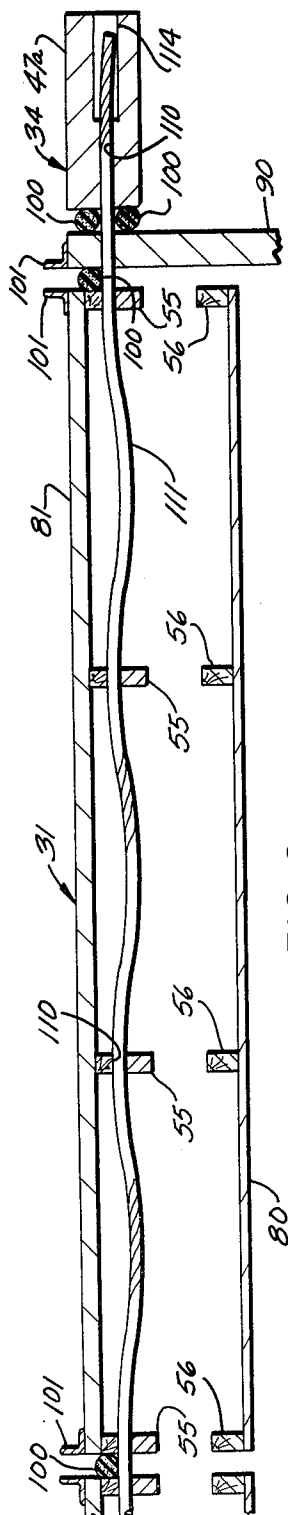


FIG. 9

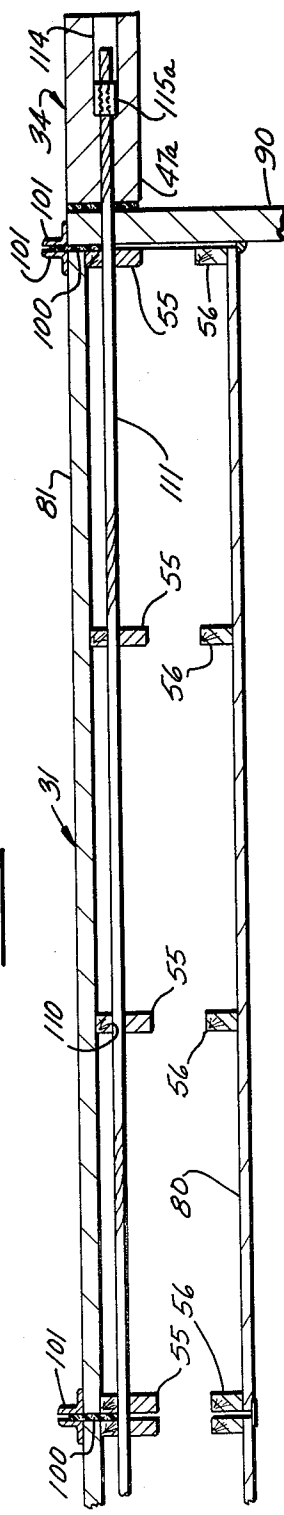


FIG. 10

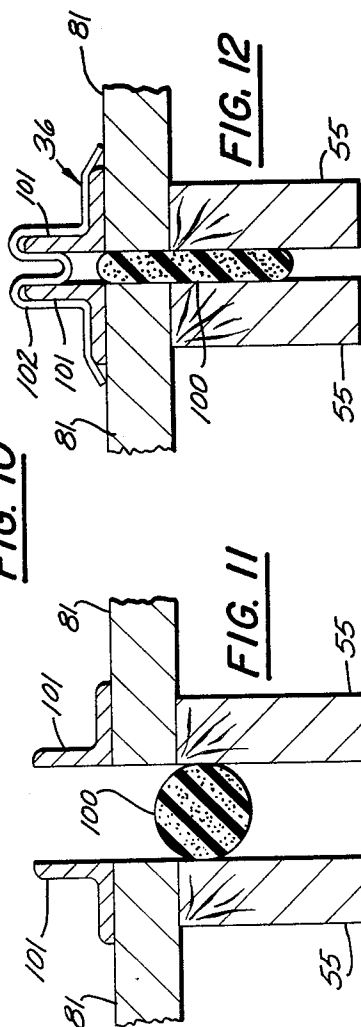


FIG. 12

FIG. 11

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9 Sheets-Sheet 8

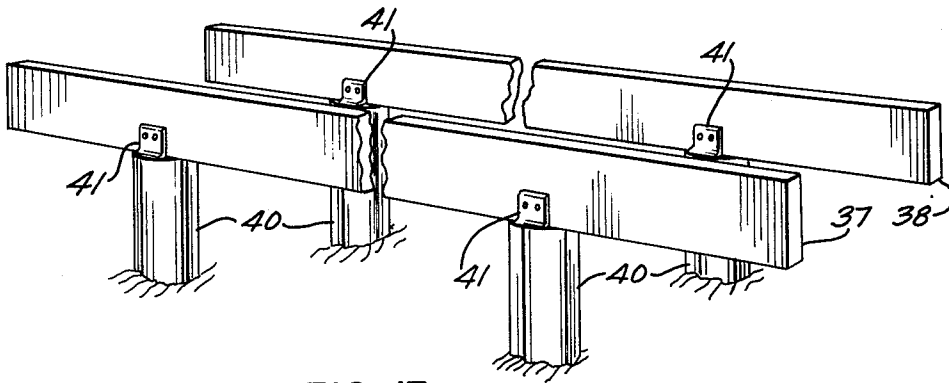


FIG. 13

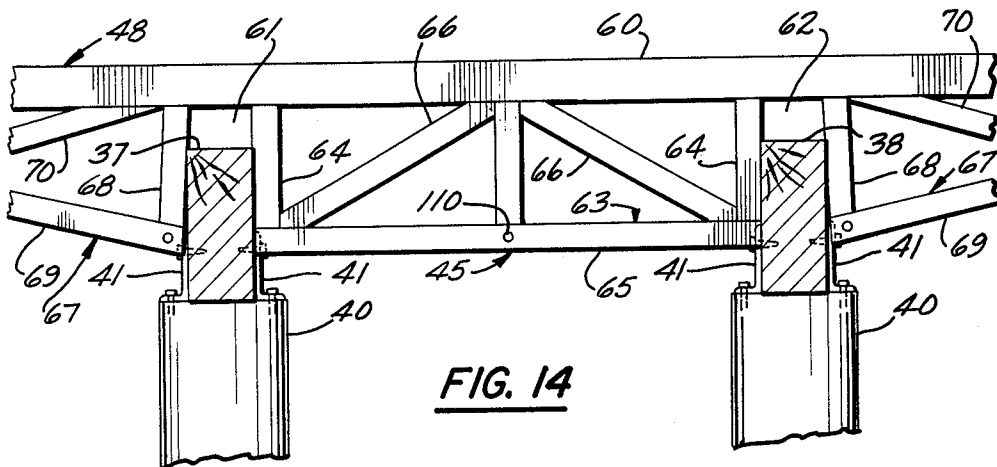


FIG. 14

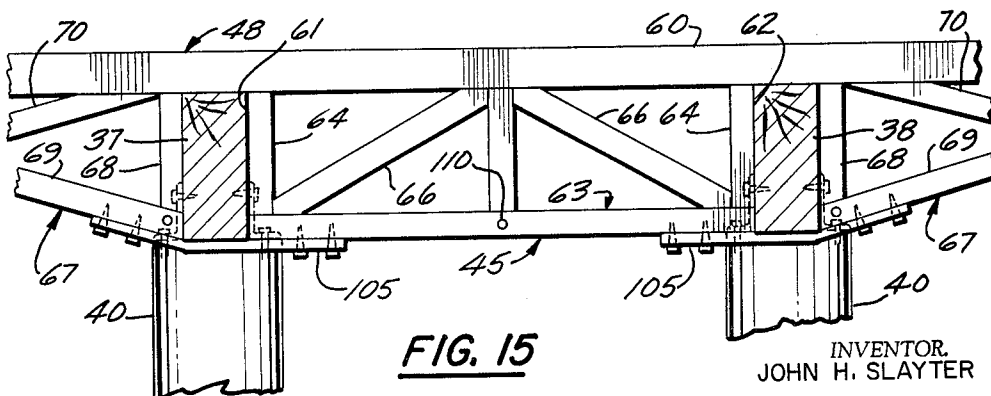


FIG. 15

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9 Sheets-Sheet 9

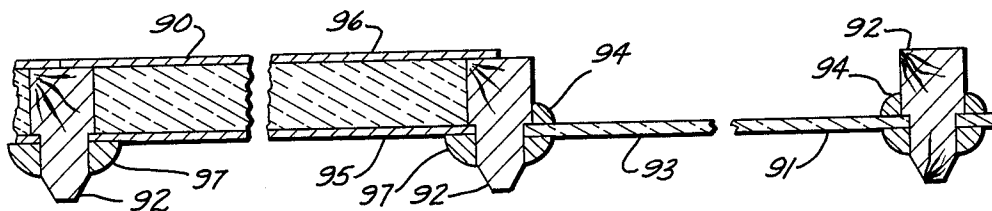


FIG. 16

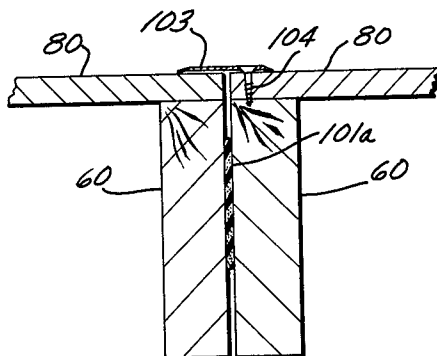


FIG. 17

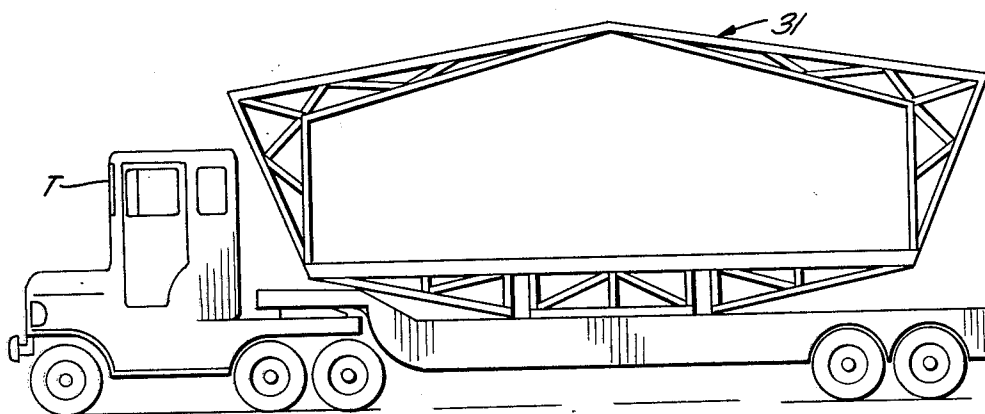


FIG. 18

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3,156,018

PLANT-MANUFACTURED BUILDING STRUCTURE

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Filed Dec. 21, 1961, Ser. No. 160,984

23 Claims. (Cl. 20-2)

My invention relates to a plant-manufactured building structure. It has to do, more particularly, with a modular or segmentized building structure formed of prebuilt cooperating assembled transverse sections or modules, with the structure of the assembled transverse sections or modules to be used in such a building structure, and with the prebuilt transverse trusses used in the formation of such building sections. It also relates to novel details of structure incorporated in the trusses, building sections, and the completely assembled building structure.

Extensive research and development activity has occurred in connection with prebuilt building structures, especially residences, in years past and has been even more pronounced in the last few years. Many structures have resulted from this activity and many of such structures have very desirable features. However, it is commonly accepted that the best buy in housing today is in the mobile type house. This is due mainly to the fact that mobile houses are completely built and assembled at a factory or plant where labor is more efficient, due in part to availability of tools and machines and to assembly line production technique. Also, parts can be more readily standardized and more efficient purchase of material is possible. Also, so many utilities, appliances, heating and plumbing units, accessories, and so many units of furniture can be installed or built in at the factory and these can be bought in large quantities at a reduction in price per unit. This is also true for the interior finishing and decorating materials including floor tile, wall and ceiling tile, carpet, paneling, and various other finishing and decorating materials. Furthermore, mobile homes can be moved easily to desired sites and practically no site preparation is required to receive them. Movement to a different site without much difficulty is possible. Even financing is more simple because the mobile type house is financed as a chattel due to the fact that because of its mobile nature it can be repossessed without undue physical difficulty.

Many attempts have been made to design and construct prebuilt buildings, especially homes, which have all these advantageous features of mobile homes but these attempts have not been successful to any great extent. It is believed that my invention accomplishes this in such a manner that the resulting building structure still appeals to the buyer who is interested in a permanent type home. Furthermore, the resulting design is such that sections can be added to the basic building as the need requires. Because the building structure is formed of cooperating transverse sections or modules, the building structure can be of any predetermined or selected initial size and can be expanded readily as necessary or as desired. This feature is possible because the individual transverse sections require no interior posts or partitions for support, neither are transverse walls required at the edge transverse frame members of the sections for structural purposes. This makes my building structure desirable not only for home construction but especially for use in motels, hospitals, schools, etc. where quite often the building structure required is a basic section with additional sections which are identical with each other and to which it is desired to add more identical units as required. My invention comprises a modular type building structure which makes all this possible. Also, the modules are such that they can be

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easily loaded on a trailer or similar vehicle and transported to the use site where they can be easily unloaded. Furthermore, the sections are so constructed that each is a complete structural unit in itself, requiring no structural support from adjacent sections when incorporated in a building, and there is no danger of racking or twisting out of line during handling or use. After installation and assembly, the building modules or sections will cooperate with each other to produce a weathertight building structure, which will withstand wind pressure at all of its surfaces, roof loading such as from snow, and floor loading due to weight of the contents of the building and traffic of people in the building. Furthermore, when incorporated in a building structure each section is sound and vibration insulated and isolated from the adjacent section so that mechanical and sound vibrations are not transmitted from one section to another. As indicated above, if necessary, the basic structure can be added to from time to time or the building sections can be readily separated from each other and moved to another location for reassembly.

Many other advantageous features will be apparent from the following description and the accompanying drawings.

In general, this invention embodies a modular building structure made up of a plurality of transverse modules or sections which can be disposed in cooperative relationship, drawn together and clamped together with weathertight and vibration dampening joints between the modules or sections. The modules or sections rest upon and are supported upon a plurality of longitudinally extending main supporting beams upon which they slide when drawn into cooperative clamped relationship as indicated above. Each of the sections or modules includes a plurality of basic truss units which extend transversely of the sections and which are structurally connected together. Each of these basic truss units is a composite unit which includes a pair of supporting outer or side columns, a pair of inwardly extending cantilever type truss arms which serve to support the roof deck, and which may support ceiling panels, which meet midway of the columns, and a floor joist beam or truss portion which is connected to the lower ends of the columns. This arrangement is such that roof loads cause the cantilever arms to be in compression and to act through the columns to cause the floor joist to be in tension. The floor joist is provided with yokes midway of its ends which fit around and embrace the main supporting beams, preferably two parallel beams, and the entire composite truss unit is supported thereby. The floor joist or truss portion straddles the beams at its yokes in such a manner that roof loads acting through the columns at the outer ends of the floor joist tend to create a gripping action of the floor joist yokes on the beams.

In the accompanying drawings, I have illustrated one embodiment of my building structure and examples of units and structures used therein but it is to be understood that details of all these structures may be varied as to appearance and materials without departing from basic principles of my invention.

In these drawings:

FIGURE 1 is a general perspective view of an assembled building structure, for example a house, which embodies units or structures of my invention.

FIGURE 2 is an elevational view of a composite transverse truss unit which includes roof rafters, side columns and floor joist portions.

FIGURE 3 is an enlarged horizontal sectional view taken along line 3-3 of FIGURE 2.

FIGURE 4 is a perspective view, partly broken away, of a prefabricated and assembled transverse building sec-

tion which includes a plurality of the truss units of FIGURE 2.

FIGURE 5 is a perspective view showing a plurality of prefabricated building sections similar to that of FIGURE 4 along with associated structures in position on main supporting beams preparatory to being moved on said beams into cooperative clamped relationship.

FIGURE 6 is an enlarged detail in longitudinal section illustrating a portion of a cable arrangement used according to my invention for sliding the sections on the supporting beams into cooperative relationship and clamping them in such relationship.

FIGURE 7 is a perspective view similar to FIGURE 5 but showing the building sections drawn and clamped together into the final assembled building structure.

FIGURE 8 is an enlarged edge view of substantially one-half of the transverse building section illustrated in FIGURE 4 but showing the associated main supporting beam.

FIGURE 9 is an enlarged longitudinal vertical sectional view taken substantially along 9—9 of FIGURE 5 and at the location indicated by line 9—9 in FIGURE 8, through associated transverse building sections, and showing the sections before they are drawn together.

FIGURE 10 is a view similar to FIGURE 9 taken substantially along 10—10 of FIGURE 5 and at the location indicated by line 10—10 of FIGURE 8.

FIGURE 11 is an enlarged sectional view through a sealing joint used between the transverse building sections and of the type shown in FIGURE 9 with the gasket thereof in non-compressed condition before the sections are drawn together.

FIGURE 12 is a view similar to FIGURE 11 but showing the sealing joint after the gasket thereof has been compressed by drawing the building sections together as shown in FIGURE 10.

FIGURE 13 is a perspective view showing the two longitudinally extending main supporting beams for receiving and supporting the transverse building sections and illustrating supports for the beams.

FIGURE 14 is an enlarged transverse sectional view through a portion of the assembled building structure showing the positioning of one of the transverse truss units on the longitudinally extending main supporting beams.

FIGURE 15 is a view similar to FIGURE 14 illustrating how weight applied to the truss unit causes a gripping action thereof on the main supporting beams.

FIGURE 16 is an enlarged transverse horizontal sectional view taken along line 16—16 of FIGURE 7 giving an example of a wall panel and window arrangement.

FIGURE 17 is an enlarged fragmentary longitudinal sectional view through the floor of the assembled building structure at the joint between adjacent sections of the building structure.

FIGURE 18 is a diagrammatic view illustrating how one of the assembled transverse sections may be transported by a truck tractor-trailer combination.

With reference to the drawings, I have illustrated generally in FIGURE 1 a building structure embodying principles and structure of my invention. The building structure shown is of the type used as a house or residence but it is to be understood that this is merely one example of a building which can be built according to my invention. The illustrated building structure consists of a plurality of transverse modules or sections which are identical in basic structure but which may vary from each other in exterior design and finish and in interior design and finish. Also, the interiors of the various sections may have built-in equipment which varies from section to section. For example, usually one of the sections is a utility core or section which will contain kitchen, bathroom and heating and/or air conditioning equipment. This section may be located relative to the other sections as desired. Other

sections may have living room furniture built in and still other sections may have bedroom furniture built in. Thus, there may be wide variation in regard to the relationship and to the equipment of the various sections. In the example illustrated, I have shown the house as consisting of three main sections 31, 32 and 33 but it is obvious that this number could be varied. End trim and clamping flange sections 34 and 35 are provided to enhance the appearance of the house, and as will be clear later, to aid in clamping and holding the sections 31, 32 and 33 together. Furthermore, as will later appear, the material used in the house is not critical but for illustrative purposes the house is shown constructed mainly of wood. However, it could be of steel or plastic or various combinations of wood, steel and plastic materials. Weathertight sealing and vibration dampening or insulating joints of suitable design indicated generally at 36 are provided between the various sections.

The support for the entire house is shown as consisting of the longitudinally extending main supporting beams 37 and 38, preferably two in number, which are disposed in parallel relationship. These beams are preferably formed of pre-stressed reinforced concrete although they could be of other material such as steel or wood. They may extend beyond the ends of the basic structure even farther than as shown in FIGURE 1 so additional sections can be added to the ends of the original structure by positioning and supporting them on the projecting beam ends. Before the additional sections are added, the projecting ends of the beams could be used as porch or patio supports, if desired.

Supporting the various building structure sections by beams of this type substantially eliminates any necessary site preparation even though the land is rolling in character. These beams 37 and 38 may be suitably supported, as indicated in FIGURES 7 and 13, by upright concrete posts 40 or other posts or columns having their lower portions sunk sufficiently in the ground, a pair or more of these posts preferably being provided for each beam depending on beam length. As shown in FIGURE 13, the posts 40 are so located that the ends of the beams project outwardly beyond the posts. Suitable saddles 41 may be provided at the upper ends of the posts for receiving and retaining the beams, the saddles being rigidly attached to the posts and to the beams by suitable bolts or the like.

The basic transverse truss unit used in my building structure is illustrated in FIGURE 2 and is designated generally by the numeral 45. One-half of it is also shown clearly in FIGURE 8. As previously indicated, this unit is a composite unit which consists of a pair of vertically disposed supporting outer side columns 46, a pair of inwardly extending cantilever type truss arms 47 which extend inwardly from the supporting columns, and a floor joist beam or truss portion 48 extending between and secured to the lower ends of the supporting columns. The entire unit is fabricated from suitable members which may be of wood and which can be joined together by suitable metal cleats or brackets 49, such as those illustrated in FIGURE 3.

The supporting columns 46 are of the type known as the "bent" type in the art and are of substantially triangular form. The size of the triangle depends on the stiffness of the material from which the column frames are constructed and the moment which they are required to resist. Each column 46 includes the vertically disposed load-receiving inner compression member 51 and the outwardly and upwardly extending outer tension member 52 which is joined to the member 51 at its lower end, it being noted that the member 52 diverges upwardly from the member 51 and extends to a higher level. These members are structurally joined together by means of suitable strut members and including the upper main strut member 53 which is connected to the upper end of the compression column member 51 and extends upwardly and outwardly to a connection with the upper end of the tension

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column member 52 which diverges relative to the member 51. All the indicated joint connections and those to be referred to later in connection with this unit may be rigid connections similar to the rigid joint connection shown in FIGURE 3.

The inwardly extending cantilever beam arms 47 meet midway of the unit 45 at a mid-joint 54 which may or may not be a rigid connection. Each arm includes an upper continuous tension member of chord 55 and a lower continuous compression member or chord 56. The chord members 55 and 56 diverge vertically toward their outer ends from the inner end of the arm at the joint 54 where they converge and meet. The chord members are structurally tied together by means including the diagonal strut members 57. The outer end of the chord member 55 is rigidly connected to the upper end of the column member 52 at a gusset joint 58 and the outer end of the chord member 56 is connected to the upper end of the column 51 by a gusset joint 59, the strut 53 extending between these joints as indicated. Thus, each cantilever arm 47 is carried by the column 46 which is of the bent type. The chord 55 is preferably inclined to provide a pitch on the roof which it is to support.

The floor joist beam or truss portion 48 comprises the main upper continuous chord member 60 which extends between the lower convergent ends of the side columns 46 and the outer ends of which are rigidly connected thereto. This member serves mainly as a tensile member for preventing outward spreading of the lower ends of the columns 46. The chord member 60 is braced by suitable braces which are so arranged to provide the yoke spaces 61 and 62 which are spaced slightly outwardly from the midpoint of the member 60. These braces include a center portion 63 of substantially rectangular form depending from the member 60 and which provides the inner depending side or arm 64 of each yoke. Connected to the lower ends of the arms 64 and between these arms is a chord or compression member 65. The section 63 is braced by the struts 66. The ends of the chord member 60 is braced by sections 67 of triangular form, each of which has the depending yoke arm 68 at its inner end. Rigidly connected to the lower end of this yoke arm is a chord member or compression member 69 which angles upwardly and outwardly and is rigidly connected at its outer end to the member 60. The section 69 is braced by the diagonal strut 70.

Thus, it will be apparent that the unit 45 is a composite truss unit which includes roof-supporting cantilever arms carried by side columns which are connected together at their lower ends by a continuous floor joist which includes the continuous tension member 60. This floor joist includes the beam-straddling yokes having the beam spaces 61 and 62 which will function in a manner to be described later.

As previously indicated, a plurality of the composite truss units 45 of FIGURE 2 are used in producing a standard transverse module or section such as that illustrated in FIGURE 4. For clarity, I have shown two of these units structurally joined together to form a transverse section which would be, for example, four feet in the direction of the longitudinal axis of the building in which it is to be used. However, in actual practice, the unit could be any multiple of this dimension in the longitudinal direction, for example eight feet, which would consist of three of these truss units structurally joined together.

In joining these truss units 45 together, various braces or struts 75 are provided between the aligning depending sections carried by the floor joists 48. Similarly, various braces or struts 76 are provided between the chord members 56 of the cantilever arms 47. However, the more important means for structurally joining these units 45 together is the inner skin of the module or section. This inner skin may be of various materials in sheet or other form extending from one unit 47 to the other and being

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rigidly fastened thereto, such as by nails, screws, cleats, or any other suitable way. For example, sheets of plywood or the like may be used to form the continuous skin 80 as shown in FIGURE 4. This skin is formed by running the sheets between all the inner members of the units 47, that is, between the inner chord members 60 of the floor joists 48, between the inner chord members 51 of the side columns, and between the inner chord members 56 of the roof cantilever arms 47. This inner skin will be the main factor in preventing racking, in a direction at right angles to the transverse plane of the trusses or frames, of the section or module during transportation or use. Racking resisting transversely or in a line parallel to the transverse frame line is inherent in each frame itself. Wherever the skin is broken by windows or other openings, the opening framing is so arranged that it connects the skin portions on opposite sides of the opening. With this arrangement, stresses are transmitted effectively from one truss unit 45 to the next. This inner skin, along with the transverse frame or truss units, will, therefore, effectively resist racking of the transverse building section or module during transportation and after it is incorporated in the building structure. The extent of the section or module in the direction of the longitudinal axis of the building is limited only by width limitations prescribed for the highway over which the section is to be transported and the width limitations prescribed by the design of the transporting vehicle.

The transverse building section or module can be transported readily on a tractor-trailer combination T as illustrated diagrammatically in FIGURE 18. This entire section may be any of the sections 31, 32, or 33 to be assembled into the building structure. The entire section, for example the section 31, can be lifted bodily by a crane by loading onto the trailer or removal therefrom. Racking or twisting will be precluded during these operations since each section is a self-contained structural unit as pointed out above.

The type of outer skin provided on each building section is not too important provided it is sufficiently weather-resistant. Consequently, panels of various materials including plastic and glass may be used as the wall will be a curtain-type wall rather than a load-bearing wall. The details of the outer skin are not important and it will be apparent that the outer skin of the roof will be carried by the outer or upper inclined chord members 55 and as indicated in FIGURE 4, this roof skin or deck may be sheets 81 of various materials. As previously indicated, these sheets need only be of sufficient strength to support wind, snow or other roof loads and are not primarily designed to provide a structural connection between the adjacent truss units 45. The floor may or may not have a lower skin but, if provided, it will be attached to the lower chords 65 and 69 of the depending sections 63 and 67, respectively, of the floor joists. For example, this skin may be in the form of sheets or panels 82 as shown in FIGURES 5 and 8. The outer skin for the side walls, indicated generally at 83, may be attached either to the inner vertical members 51 of the side columns 45 outwardly of the skin 80 or to the outer edges of the inclined chord members 52 of the side columns. Both arrangements are illustrated in FIGURE 5 of the drawings, where a door panel 84 is shown at the inner edges of the cooperating side columns and a window panel 85 is shown at the outer edges of the cooperating side columns.

As previously indicated, end sections 34 and 35 are provided for use in clamping the various sections 31, 32 and 33 together, as will later appear. The end sections are identical and the particular construction thereof is not too important as long as each is capable of applying the necessary clamping pressure to the associated main section and is of pleasing appearance. In general, the end section is of an outline corresponding substantially to the outline of the peripheral edge of one of the build-

ing sections 31, 32 or 33. Thus, each end section includes the upper inclined portions 47a, the inclined side portions 46a, and the lower inclined portions 67a. An additional separate lower horizontal portion 63a may also be provided. In transverse cross-section, each of these clamping portions is in the form of a solid beam member as shown in FIGURES 6, 9 and 10 or of a hollow box girder. Any suitable material may be used for this end section.

For positioning between each end section and its associated module or building section, an end wall panel or section 90 is provided. This end wall 90 may be of any suitable material and since it is not a load-supporting wall, it may be of the curtain-wall type. Thus, as shown in FIGURES 5 and 7, this wall may be of the panel type and may have windows or other openings 91 therein. A specific example of a suitable wall is illustrated in FIGURE 16. Thus, the wall 90 may include uprights or studding 92 of wood. The laterally spaced studding may have panels 93 of diaphanous glass or plastic which are recessed between adjacent studs and are suitably held therein by clamping cleats 94. The solid part of the wall may be of inner and outer panels 95 and 96, the outer panels 96 being attached directly to the outer edges of the studs and the inner panels being recessed between the studs and held therein by means of the cleats 97. This specific wall construction may also be used for the side walls of the main transverse building sections if desired. Thus, the end wall unit is a wafer or section which can be positioned between an end clamping section and a main section or module of the building.

The sealing joints 36 to be used between the various sections 31, 32, 33, 34, and 35 may be of any suitable form capable of making the building structure weathertight at the joints and capable of absorbing or dampening vibrations between the adjacent sections. A suitable form of joint is disclosed in FIGURES 9 to 12. With this arrangement, one or more continuous compressible gaskets 100 of suitable material, such as rubber or plastic, are positioned (FIGURE 8) between the peripheral members of the adjacent trusses 45 of the adjacent building sections before they are drawn together. This gasket is preferably of circular cross-section form (FIGURE 11) before being compressed and is of flattened oval cross-section (FIGURE 12) after being compressed.

The roof deck panels 81 at the joints 36 may be provided with upstanding flanges 101 at the edges thereof. These may be provided by metal angles secured to the upper surfaces of the panels. A finish and closure strip 102, preferably of metal, may be slipped over the flanges 101 and will tightly embrace them so as to be firmly held in place. The resulting joint will appear as in FIGURE 1. Similar sealing joints will be used at the outer joints in the side walls.

The floor joints may be constructed as shown in FIGURE 17. Thus, a sealing gasket 101a may be compressed between the chord members 60 of adjacent floor joists. The joint at the upper surface of the floor panels 80 may be provided with a finish joint-covering strip 103. This strip may be fastened to the upper surface of one panel of the skin 80 by the screws 104 and will extend freely over the upper surface of the adjacent panel. The same type of finish strip may be used in association with the joints between the ceiling panels of the inner skin 80 and between the joints of the side wall panels of the skin 80. Tile, carpet, or other floor covering materials may be provided over the panels. If desired, the sealing gasket 100 may extend, as indicated in FIGURE 8, between the lower chord members of the floor joist and up around the beams 37 and 38 between the yoke arms 64 and 63 and members 60 of adjacent floor joists.

Assuming the various transverse building sections have been fabricated as indicated and have been delivered to the building site by truck-trailer combinations and assuming the beams 37 and 38 are set, the assembly of the

building structure will proceed as follows. The sections 31, 32 and 33 are lifted directly from the trailers and are set on the beams 37 and 38. The manner in which each truss unit 45 of the various building sections 31, 32 and 33 will be positioned over and will cooperate with the beams 37 and 38 is indicated in FIGURES 14 and 15. Each yoke portion will slide over the cooperating beam, as indicated in FIGURE 14, with the arms 64 and 68 on opposite sides of the beams and snugly contacting therewith. As the building section settles down on the beams to its final position resting thereon, the floor truss chord members 60 will rest on the upper edges thereof and support the building section as shown in FIGURE 15. The weight of each section will normally hold the section in position on the beams 37 and 38 but to guard against upward displacement by hurricane type winds, cleats or strips 105 may be provided. These strips may be of metal and will be extended across and beneath the beams 37 and 38 and their opposite ends will be rigidly fastened to the respective chord members 65 and 69. Thus, they engage the lower edges of the beams 37 and 38 and resist upward lifting of the building section.

The sections 31, 32, and 33 are positioned on the beams 37 and 38 in the correct order, as indicated in FIGURE 5, in slightly spaced relationship. The end wall panels 90 are positioned between the section 31 and end section 34 and between the section 33 and end section 35. The sections 31, 32 and 33 will be slidably resting at this time on the beams 37 and 38. The end wall panels 90 will have yoke portions (not shown) which slidably fit over the beams 37 and 38 like the yoke portions of the sections 31, 32 and 33. The end sections 34 and 35 may be suitably supported in alignment with the associated end sections 34 and 35 at this time. To slidably move these sections into the cooperative relationship indicated in FIGURE 7 and to clamp them in such relationship, the cable arrangements shown in FIGURES 6, 9 and 10 may be provided.

At various locations spaced around each of the various building sections adjacent the peripheral edges thereof, are cable-receiving openings 110. When the various sections are in alignment, these openings are in alignment to provide the angularly spaced sets of longitudinally extending openings, each set being adapted to receive a tension cable 111 extending completely through the house. Suitable means is provided for applying tension to this cable 111 to draw the various sections together so as to compress the gaskets of the various sealing joints and to hold the sections in cooperative weathertight relationship.

One means of tensioning the cable 111 is shown in FIGURE 6 and includes a hook 112 which hooks into an eye 113 in the end of the cable. This hook is arranged at the end section 34 and the opposite end of the cable will be suitably anchored to the other end section 35. This hook may extend through the aligning openings 110 in the section 31, end wall panel 90, and end section 34. At the outer edge of the section 34, it may be provided with a socket 114 opening outwardly and communicating at its inner end with the opening 110. The end of the hook is threaded and is disposed in this socket and receives a tensioning nut 115. Between a washer 116 movably mounted on the hook joist inside the nut 115 is a compression spring 117 which engages the inner end of the socket 114. By adjusting the nut 115, proper tension may be applied to the cable 111 to pull the various sections into tight engagement. The spring 117 will thereafter permit expansion and contraction of the building structures due to temperature or other atmospheric conditions. Each section 34 or 35 will function as a clamp-spaced cables 111 evenly around the gasketed perimeter of the assembled building structure. It will be noted that a pair of the gaskets 100 is provided at the outer side of the end wall panel 90, the gaskets of the pair being lo-

cated above and below the hook 112 to prevent tilting of the beam 34 when the cables are drawn up tightly.

A similar arrangement is shown in FIGURES 9 and 10 but in this case, the cable itself may be of material of sufficient elasticity to permit expansion and contraction, such as nylon. In this instance, it will merely be necessary to provide a collar 115a in the socket 114 through which the cable 111 can be pulled to tension it and which will automatically grip the cable to hold it in tensioned condition; FIGURE 9 shows the cable 111 before tensioning with the sections separated and FIGURE 10 shows the sections after they are drawn together to compress the gaskets at the various joints between the sections.

With the sections 31, 32, 33, 34, 35, and 90 clamped together as indicated, the building structure will remain weathertight even though relative expansion and contraction of the sections along the beams 37 and 38 is possible. Each truss unit 45 will function so that any load applied to the roof will result in a compressive force on the cantilever arms 47 which will be transmitted to the "bent" type side columns 46. A load on the roof deck results in tension on the chord member 55 and this is transmitted through compression struts 57 to the chord 56 which will be in compression. Strut 53 will be in compression as will column member 51. Column member 52 will be in tension because of the upward pull thereon by the chord 55. Spreading the lower ends of the columns will be precluded by the continuous floor joist chord members 60 which will be placed under tension. This will exert downward forces at the outer ends of the chord members 60 of the floor joist portions of the unit which will be transmitted inwardly through the chord members 69 to the lower ends of the yoke arms 68. Consequently, end beam 37 or 38 will be gripped between the yoke arms 64 and 68. Thus, ordinarily roof loads and floor loads outwardly of the beams 37 and 38 will produce a gripping action of the building sections on the beams 37 and 38. Any unusual or abnormal winds, such as hurricane winds, acting against the house and tending to lift it, will be resisted by the cleats or strips 105 engaging the lower edges of the beams 37 and 38. The truss units 45 of each building section 31, 32, and 33 are joined together structurally mainly by means of the inner skin 80 which is rigidly connected to the inner members of the truss unit. Thus, each section 31, 32, and 33 is a complete load-sustaining structure in itself, requiring no derived structural benefit from the adjacent sections.

It will be apparent from the above that my invention provides for a building structure which is composed of standardized or segmentized transverse sections or modules which in the final assembly are clamped together in cooperative weathertight relationship. Any number of these sections may be used in the building and sections can be readily added or removed. The sections are so supported by the longitudinally extending beams that little site preparation is required. Each section is structurally complete in itself so that handling without racking is possible in delivering and installing each section. Also, the structure of each section is such that when it is assembled in the building, it will adequately withstand forces developed by various weather and other conditions even though they may be unusual. Furthermore, each section is cushioned from any adjacent section so that vibration and/or noise will not be transmitted from one section to the other. The basic transverse truss unit of each building section can be manufactured readily at a shop or factory and a section can be made from a plurality of these units at the same location. Each section may be complete as to interior and exterior finish so little work at the site is necessary. Thus, maximum efficiency and minimum cost can be obtained. Ease of assembly at the site, modification by removal or addition of sections, or complete removal and relocation of the entire structure result from my invention.

Although I have brought out many advantages of my structure, other advantages will be readily apparent.

Having thus described my invention, what I claim is:

1. A composite transverse truss unit for a building structure comprising a pair of side-supporting columns, a cantilever arm supported by each of said columns and extending inwardly therefrom, a floor joist including a continuous member connected to the lower ends of said side columns, said floor joist having downwardly opening yokes spaced on opposite sides of the midpoint thereof and inwardly of the respective ends thereof for receiving supporting beams extending at an angle to said continuous member, each yoke having an inner arm defined by a central brace structure depending from said continuous member, said brace structure including a continuous chord member having its outer ends connected to the lower ends of the inner yoke arms, and each yoke having an outer arm defined by a brace structure at each end of said continuous member, said last-named brace structure including a continuous angularly disposed chord member having its outer end connected to said continuous member and its inner end connected to the lower end of the cooperating outer yoke arm.

2. A composite transverse truss unit according to claim 1 in which each of the supporting columns is of the bent type having an inner vertically disposed compression member and an outer tension member connected at its lower end to the lower end of said compression member and diverging outwardly toward its upper end where it is connected to the outer end of the cooperating cantilever arm.

3. A composite transverse truss unit according to claim 2 in which each of said cantilever arms includes an upper tension chord having its outer end connected to said upper end of said outer tension member of the cooperating column and a lower compression chord having its outer end connected to the upper end of said column compression member.

4. A truss unit according to claim 3 including struts between the chords of each of said cantilever arms and struts between the inner and outer members of the columns, said struts including a compression member extending between the joint formed by the connection of said cantilever arm compression member and said column compression member and the joint formed by the connection of said cantilever arm tension member and said column tension member.

5. A truss unit according to claim 4 in which the cantilever arms are of triangular form with the chord members of each converging at their inner ends but being spaced at their outer ends, said inner ends being adjacent and in alignment with each other, the upper chord members slanting downwardly from an apex point at their inner ends.

6. A composite transverse truss unit for a building structure comprising a pair of side-supporting columns, a cantilever arm supported by each of said columns and extending inwardly therefrom to a midpoint where the arms meet, a floor joist including a continuous member connected to the lower ends of said side columns, said floor joist having a pair of yoke spaces for positioning over supporting beams extending angularly relative to the truss unit with one of said spaces at each side of the midpoint of the joist and spaced inwardly from the respective end thereof, said floor joist including a depending central brace structure having a compression chord extending between two inner yoke arms depending from said continuous member, said floor joist also including an outer depending brace portion at each end which includes an inwardly and downwardly angled compression chord member rigidly connected at its outer end to said continuous tension member and at its inner end to the cooperating outer yoke arm depending from said continuous member.

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7. In a building structure, a composite transverse truss unit, means for supporting said truss unit comprising a plurality of longitudinally-extending transversely spaced supporting beams, said truss unit comprising a pair of side-supporting columns, a cantilever arm supported by each of said columns and extending inwardly therefrom, a floor joist including a continuous member connected to and supporting the lower ends of said side columns, said floor joist having downwardly opening yokes spaced on opposite sides of the midpoint thereof and inwardly of the respective ends thereof and fitting over the respective supporting beams, each yoke having an inner arm defined by a central brace structure depending from said continuous member, said brace structure including a continuous chord member having its outer ends connected to the lower ends of the inner yoke arms, and each yoke having an outer arm defined by a brace structure at each end of said continuous member, said last-named brace structure including a continuous angularly disposed chord member having its outer end connected to said continuous member and its inner end connected to the lower end of the cooperating outer yoke arm.

8. In a building structure, a composite transverse truss unit, means for supporting said truss unit comprising a plurality of longitudinally-extending transversely spaced supporting beams, said truss unit comprising a pair of side-supporting columns, a cantilever arm supported by each of said columns and extending inwardly therefrom, a floor joist including a continuous member connected to and supporting the lower ends of said side columns, said floor joist having downwardly opening yokes spaced on opposite sides of the midpoint thereof and inwardly of the respective ends thereof and fitting over the respective supporting beams, each of the supporting columns being of the bent type having an inner vertically disposed compression member and an outer tension member connected at its lower end to the lower end of said compression member and diverging outwardly toward its upper end where it is connected to the outer end of the cooperating cantilever arm.

9. Structure according to claim 8 in which each of said cantilever arms includes an upper tension chord having its outer end connected to said upper end of said outer tension member of the cooperating column and a lower compression chord having its outer end connected to the upper end of said column compression member.

10. Structure according to claim 9 including struts between the chords of each of said cantilever arms and struts between the inner and outer members of the columns, said struts including a compression member extending between the joint formed by the connection of said cantilever arm compression member and said column compression member and the joint formed by the connection of said cantilever arm tension member and said column tension member.

11. Structure according to claim 10 in which the cantilever arms are of triangular form with the chord members of each converging at their inner ends but being spaced at their outer ends, said inner ends being adjacent and in alignment with each other, the upper chord members slanting downwardly from an apex point at their inner ends.

12. In a building structure, a composite transverse truss unit, means for supporting said truss unit comprising a plurality of longitudinally-extending transversely spaced supporting beams, said truss unit comprising a pair of side-supporting columns, a cantilever arm supported by each of said columns and extending inwardly therefrom to a midpoint where the arms meet, a floor joist including a continuous member connected to and supporting the lower ends of said side columns, said floor joist having a pair of yoke spaced at each side of the midpoint thereof spaced inwardly from the respective ends thereof and positioned over the respective supporting beams, said floor joist including a depending central brace

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structure having a compression chord extending between two inner yoke arms depending from said continuous member, said floor joist also including an outer depending brace portion at each end which includes an inwardly and downwardly angled compression chord member rigidly connected at its outer end to said continuous member and at its inner end to the cooperating outer yoke arm depending from said continuous member.

13. A building structure comprising a plurality of transverse sections supported on a plurality of longitudinally extending, transversely spaced supporting beams, each of said sections including a plurality of composite transverse truss units spaced longitudinally relatively and joined together structurally, each of said truss units comprising a pair of side-supporting columns, a cantilever arm supported by each of said columns and extending inwardly therefrom, a floor joist including a continuous member connected to and supporting the lower ends of said side columns, said floor joist having downwardly opening yokes spaced on opposite sides of the midpoint thereof and inwardly of the respective ends thereof and fitting over the respective supporting beams, each yoke having an inner arm defined by a central brace structure depending from said continuous member, said brace structure including a continuous chord member having its outer ends connected to the lower ends of the inner yoke arms, and each yoke having an outer arm defined by a brace structure at each end of said continuous member, said last-named brace structure including a continuous angularly disposed chord member having its outer end connected to said continuous member and its inner end connected to the lower end of the cooperating outer yoke arm.

14. Structure according to claim 13 in which each of the supporting columns is of the bent type having an inner vertically disposed compression member and an outer tension member connected at its lower end to the lower end of said compression member and diverging outwardly toward its upper end where it is connected to the outer end of the cooperating cantilever arm.

15. A building structure comprising a plurality of transverse sections supported on a plurality of longitudinally extending, transversely spaced supporting beams, each of said sections including a plurality of composite transverse truss units spaced longitudinally relatively and joined together structurally, each of said truss units comprising a pair of side-supporting columns, a cantilever arm supported by each of said columns and extending inwardly therefrom, a floor joist including a continuous member connected to and supporting the lower ends of said side columns, said floor joist having downwardly opening yokes spaced on opposite sides of the midpoint thereof and inwardly of the respective ends thereof and fitting over the respective supporting beams, said supporting columns being of the bent type having an inner vertically disposed compression member and an outer tension member connected at its lower end to the lower end of said compression member and diverging outwardly toward its upper end where it is connected to the outer end of the cooperating cantilever arm, each of said cantilever arms includes an upper tension chord having its outer end connected to said upper end of said outer tension member of the cooperating column and a lower compression chord having its outer end connected to the upper end of said column compression member.

16. Structure according to claim 15 including struts between the chords of each of said cantilever arms and struts between the inner and outer members of the columns, said struts including a compression member extending between the joint formed by the connection of said cantilever arm compression member and said column compression member and the joint formed by the connection of said cantilever arm tension member and said column tension member.

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17. Structure according to claim 6 in which the cantilever arms are of triangular form with the chord members of each converging at their inner ends but being spaced at their outer ends, said inner ends being adjacent and in alignment with each other, the upper chord members slanting downwardly from an apex point at their inner ends.

18. Structure according to claim 13 in which the truss units of each section are joined together by an inner skin extending longitudinally and connected to said units.

19. A building structure comprising a plurality of transverse sections supported on a plurality of longitudinally extending, transversely spaced supporting beams, each of said sections including a plurality of composite transverse truss units spaced longitudinally relatively and joined together structurally, each of said truss units comprising a pair of side-supporting columns, a cantilever arm supported by each of said columns and extending inwardly therefrom, a floor joist including a continuous member connected to and supporting the lower ends of said side columns, said floor joist having downwardly opening yokes spaced on opposite sides of the midpoint thereof and inwardly of the respective ends thereof and fitting over the respective supporting beams, and means provided for preventing lifting of the sections from the supporting beams, said means including members secured to the lower ends of the yokes and extending beneath said beams.

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20. Structure according to claim 19 including joints between the various sections having compressible gaskets therein for sealing and sound dampening.

21. Structure according to claim 20 including means for drawing all of said sections into cooperation to compress said gaskets, said means including tension members extending longitudinally through all of said sections.

22. Structure according to claim 21 in which said tension members comprise cables which flexibly hold said sections together to permit relative expansion and contraction.

23. Structure according to claim 22 including end clamping beams which engage the endmost sections and are pulled thereagainst by said cables which have their ends connected thereto.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,156,018

November 10, 1964

John H. Slayter

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 13, line 1, for the claim reference numeral "6"
read -- 16 --.

Signed and sealed this 30th day of March 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents