

[54] **HOUSE CONSTRUCTION AND SUBASSEMBLIES THEREOF**

[76] Inventors: **Edward B. Connelly**, 39240 Lakeshore Drive, Mount Clemens, Mich. 48043; **Reinhart Weber**, Box 373, Portage Park, Midland, Ontario, Canada

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Primary Examiner—J. Karl Bell
Attorney, Agent, or Firm—Everett R. Casey

[52] U.S. Cl. **52/237; 52/73; 52/220; 52/274**

[51] Int. Cl.² .. **E04H 1/00; E04B 1/34; E02D 27/32**

[58] Field of Search **52/73, 220, 237, 274, 245, 52/247, 293, 74**

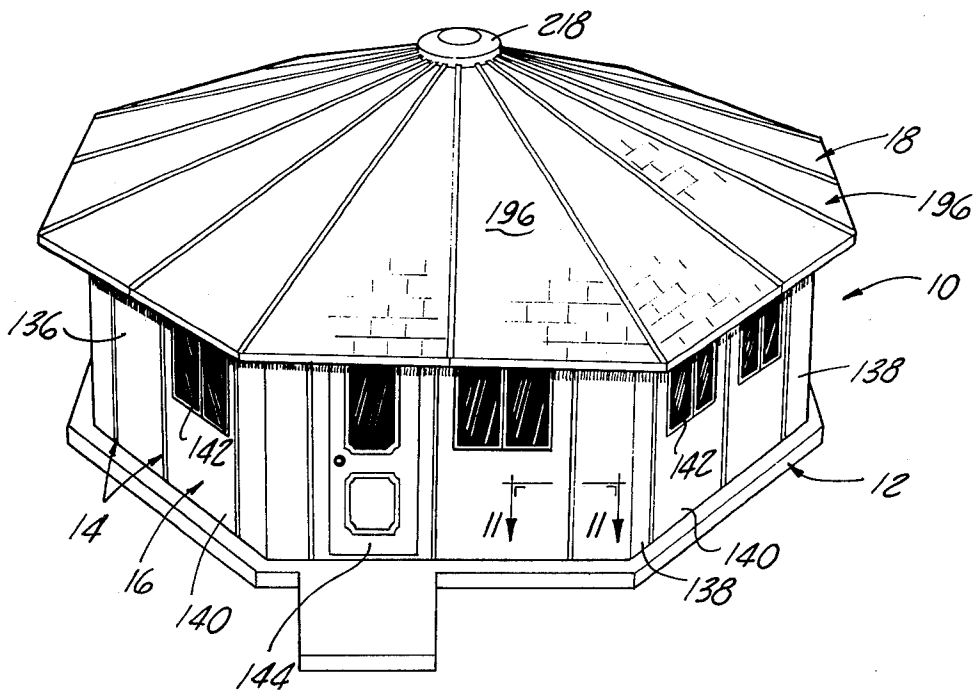
[57] **ABSTRACT**

A construction for providing an inexpensive and easy to assemble house construction including support structure, wall structure and roof structure.

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7 Claims, 19 Drawing Figures



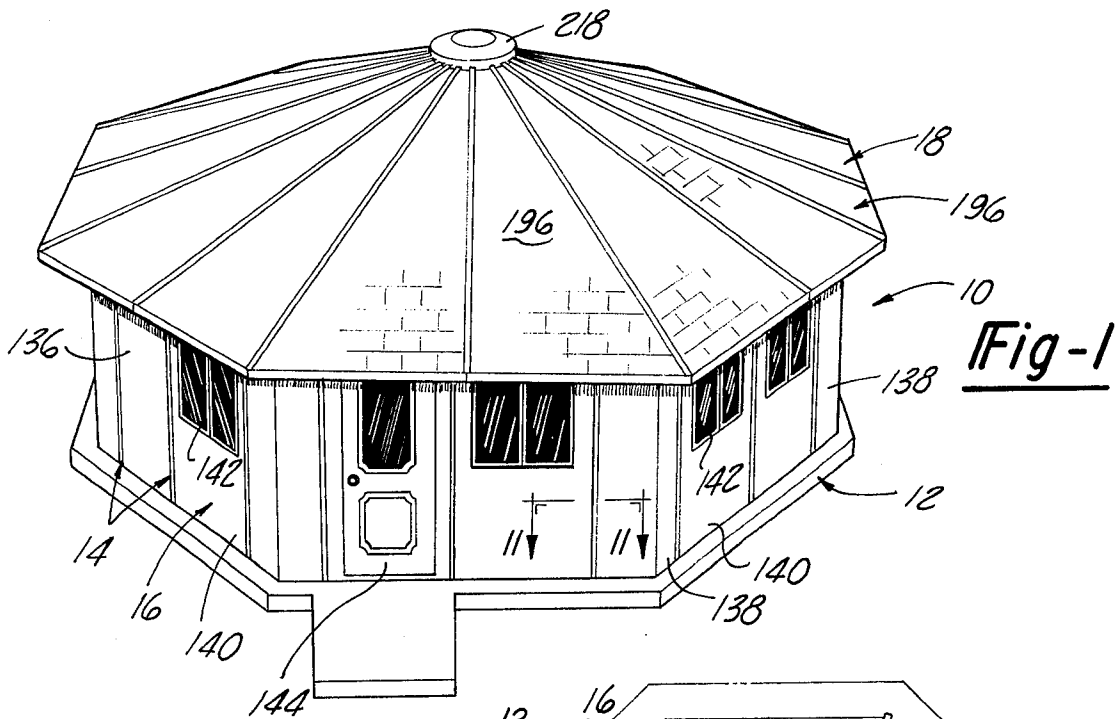


Fig-2

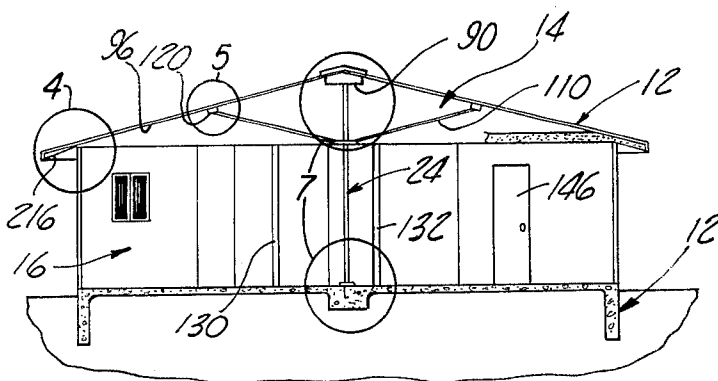
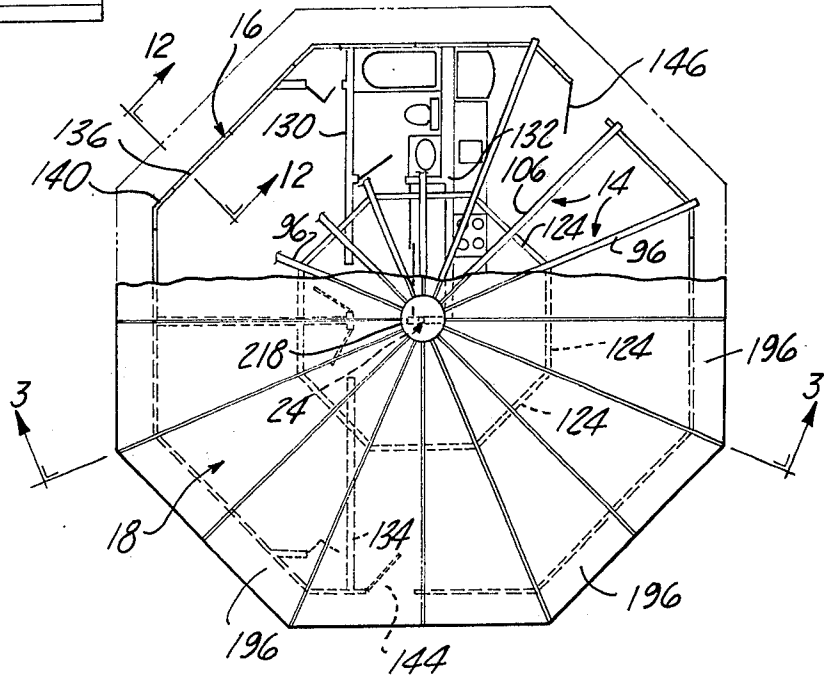


Fig-3

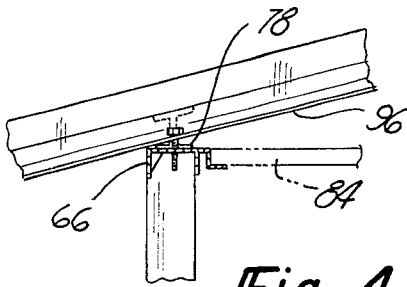


Fig-4

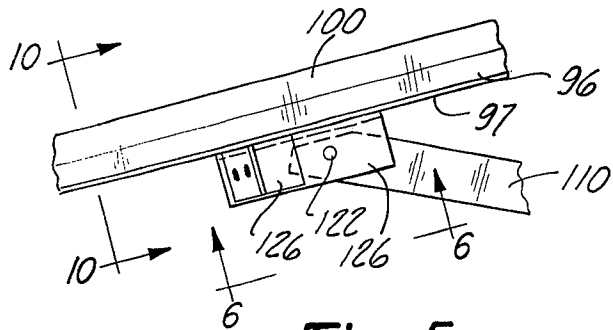


Fig-5

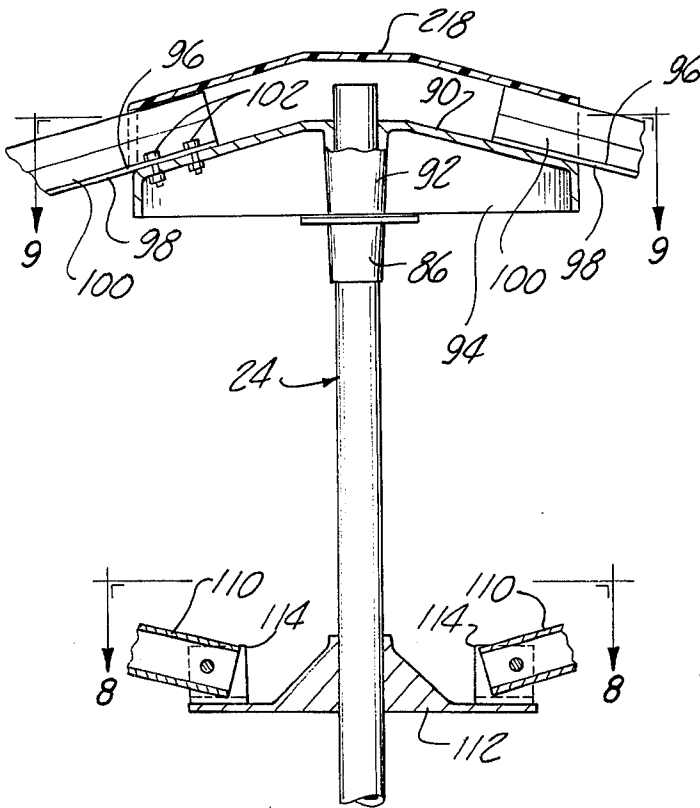


Fig-7

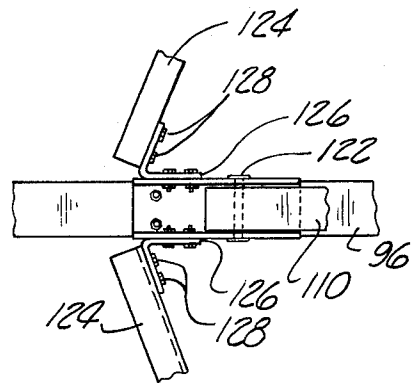


Fig-6

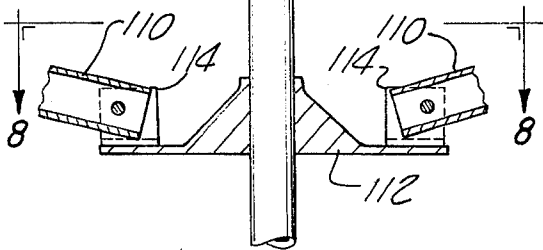


Fig-7

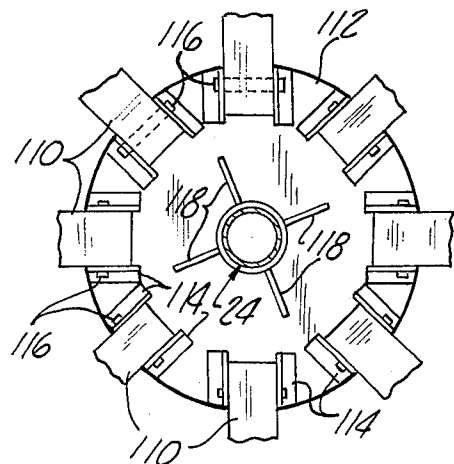


Fig-8

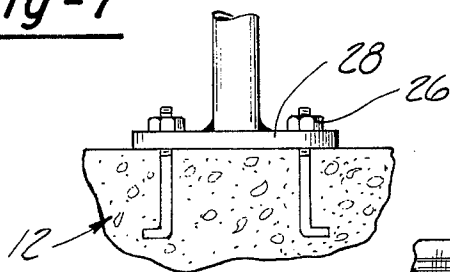


Fig-9

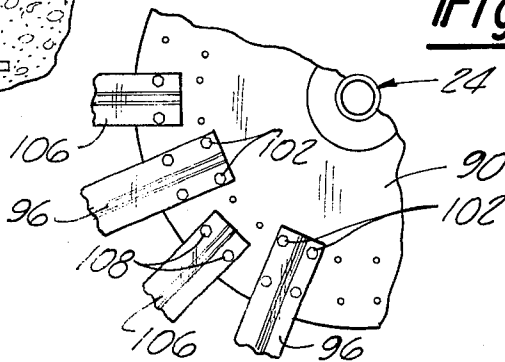


Fig-9

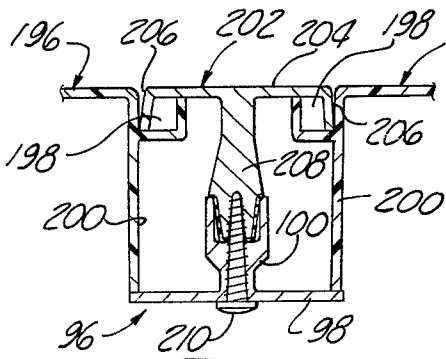


Fig-10

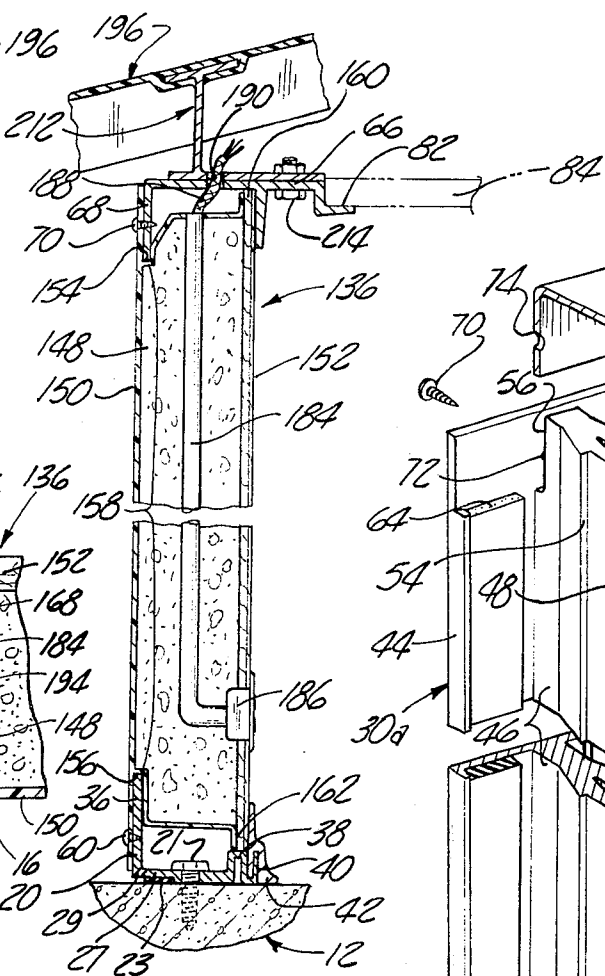


Fig-12

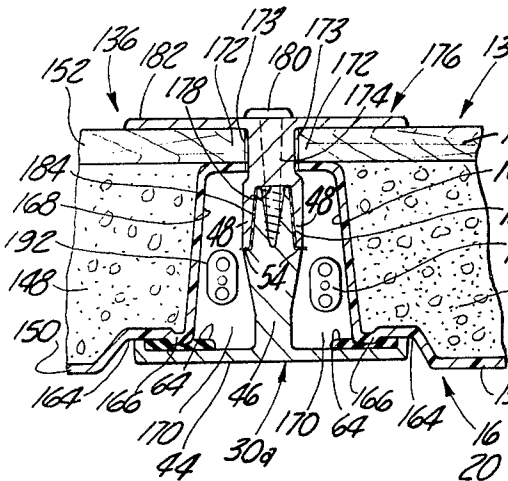


Fig-11

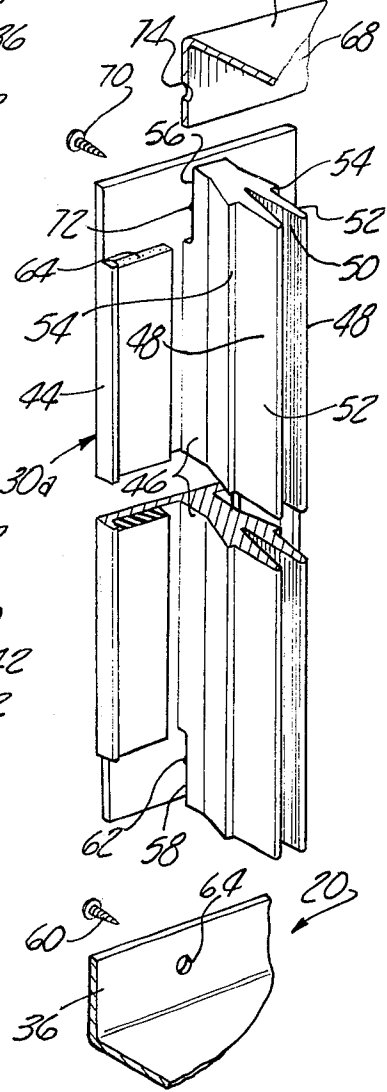


Fig-13

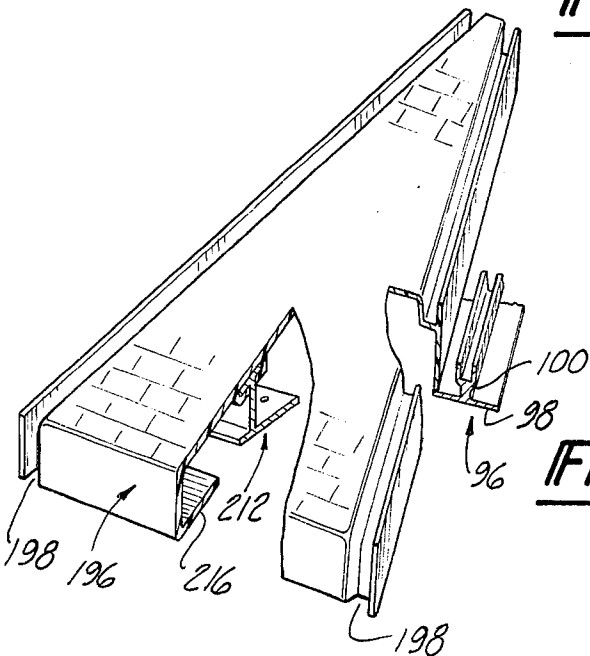


Fig-14

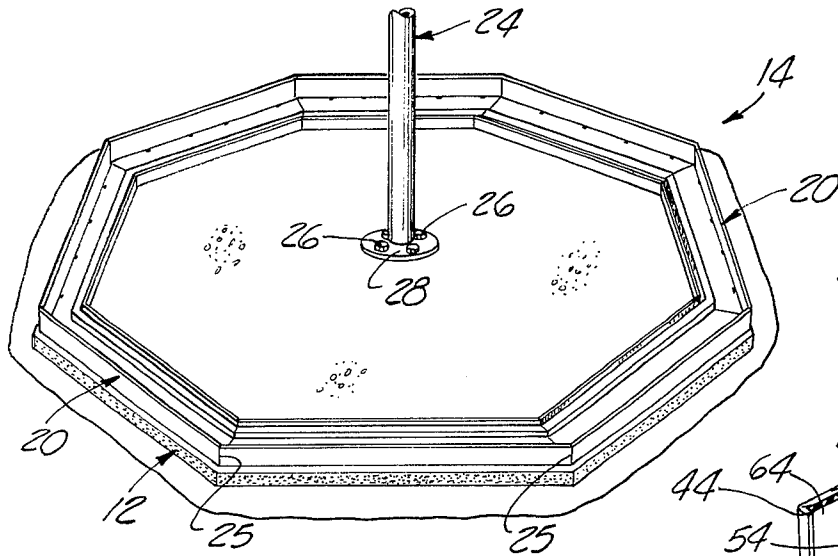


Fig-15

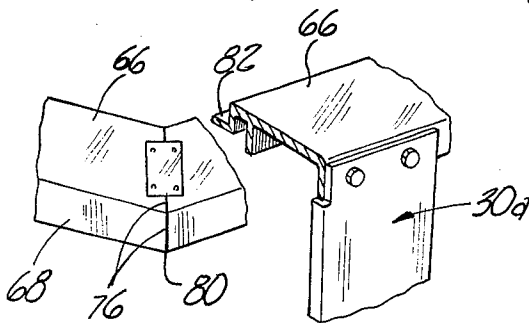


Fig-18

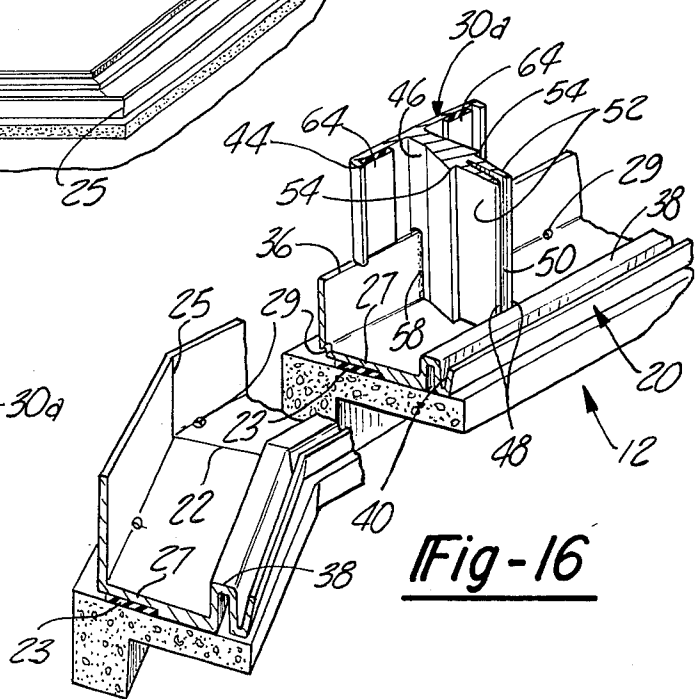


Fig-16

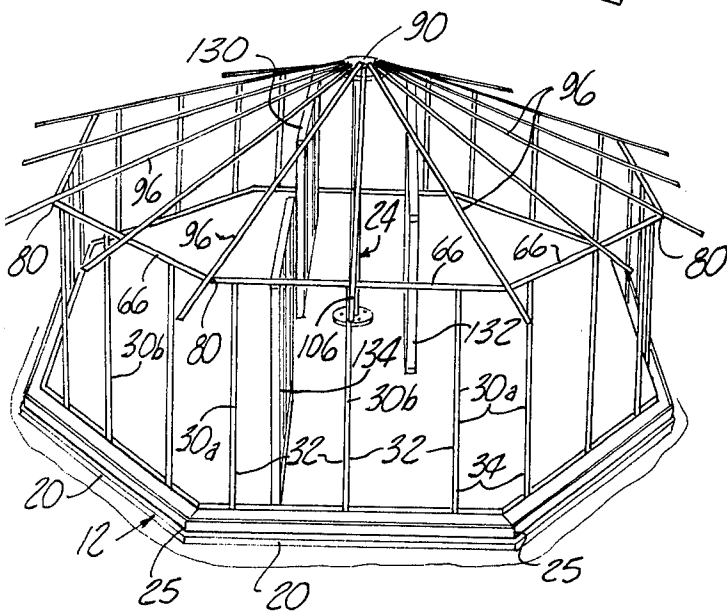


Fig-17

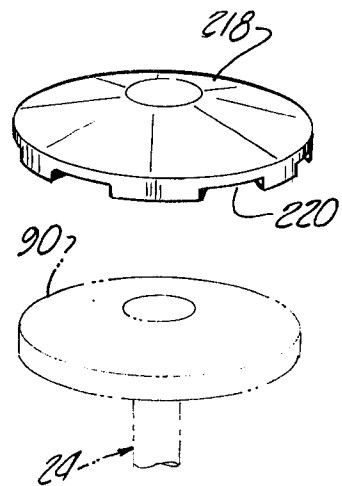


Fig-19

HOUSE CONSTRUCTION AND SUBASSEMBLIES THEREOF

SUMMARY BACKGROUND OF THE INVENTION

The present invention relates to a construction and subassemblies thereof for providing a novel, inexpensive, easy to assemble house or the like.

With the cost of housing continuously increasing there is a need for a housing construction which is inexpensive and easy to assemble. In the present invention a novel support structure is used in combination with novel wall and roof structures to provide the desired, inexpensive, house; in addition, the house assembly has good fire resistant characteristics with the wall structure having a good anti-flame propagation characteristics. Therefore it is an object of the present invention to provide a novel construction for providing an inexpensive easy to assemble house. It is another object of the present invention to provide a novel support structure and subassemblies thereof. It is another object of the present invention to provide a novel wall structure and subassemblies thereof. It is still another object of the present invention to provide a novel roof structure and subassemblies thereof.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description and the appended claims, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a pictorial view of a house construction embodying features of the present invention;

FIG. 2 is a plan view of the house construction of FIG. 1 with some parts broken away;

FIG. 3 is a sectional view of the house construction of FIG. 2 taken generally along the lines 3—3 in FIG. 2;

FIGS. 4 and 5 are views of enlarged scale of those portions of FIG. 3 encircled in the areas designated by the numerals 4 and 5 respectively;

FIG. 6 is a view of the structure of FIG. 5 taken generally in the direction of the arrows 6—6;

FIG. 7 is a view to enlarged scale of those portions of FIG. 3 encircled in the areas designated by the numeral 7;

FIG. 8 is a partial sectional view of the structure of FIG. 7 taken generally along the lines 8—8 in FIG. 7;

FIG. 9 is a view, with some parts broken away, of the structure of FIG. 7 taken generally along the lines 9—9 in FIG. 7;

FIG. 10 is a sectional view of the structure of FIG. 5 taken generally along the lines 10—10;

FIG. 11 is a sectional view of the structure of FIG. 1 taken generally along the lines 11—11 in FIG. 1;

FIG. 12 is a sectional view of the structure of FIG. 2 taken generally along the lines 12—12 in FIG. 3;

FIG. 13 is an exploded, pictorial view depicting the assembly relationship of the vertical rails, base rails and headers of the house construction of FIG. 1;

FIG. 14 is a pictorial view with some parts broken away and some in section of a roof panel and corner rail;

FIG. 15 is a pictorial view depicting the house construction in partial assembly;

FIG. 16 is a partial pictorial view of the base rail and vertical rail assembly;

FIG. 17 is a pictorial view of the support structure of the housing construction;

FIG. 18 is a partial pictorial view of the vertical rail and header assembly; and

FIG. 19 is an exploded pictorial view depicting the cap structure.

Looking now to the drawings, and more specifically to FIGS. 1—3, a house assembly 10 is shown supported on a slab 12 of cement or other suitable material, having appropriate footings. The house assembly 10 could be supported upon a foundation having a platform elevated from the ground level whereby a crawl space would be provided beneath the floor of the house assembly. The house assembly 10 comprises a support structure 14, a wall structure 16, and a roof structure 18. The inter-relationship of the structures 14, 16 and 18 can best be understood in view of the drawings of FIGS. 15—19 partially showing the sequence of assembly.

The house assembly 10 shown in the drawings is octagonal in shape; it should be noted that other polygonal shapes could be used.

In FIG. 15 a plurality of base rails 20 are secured, in an octagonal shape, to the slab 12, via fasteners 21 (see FIG. 12) driven into the slab 12 or by other fastening means. The base rails 10 are all of equal length having similarly angulated (see FIG. 16) ends 22 which abut each other in a matching relationship to define a plurality of corners 25. Sealing and insulation strips 23 are located between the rails 20 and the slab 12 to seal the interior of the house assembly from the elements. The sealing and insulation strips 23 can be made of a flexible, resilient, elastomeric material such as a pressure sensitive adhesive tape of butyl rubber. In one form of the invention the strips 23 are presecured to a notched portion 27 in the bottom of the rails 20. The strips 23 are narrower than the width of the notched portion 27; this permits clearance to the outside for drainage holes 29 formed in each of the rails 20. An elongated center post assembly 24 is secured to the slab 12 via cast-in studs 26 (see FIG. 7) which extend through openings in a base plate 28; suitable threaded nuts on studs 26 clamp the plate 26, and hence the post assembly 24, to the slab 12.

Next a plurality of identical vertical rails 30a and 30b are secured to the base rails 20 in a uniform pattern (see FIG. 17); three rails are secured to each base rail 20 with vertical rail 30b being located centrally, equidistant from end rails 30a. The end rails 30a are located a selected distance in from the ends 22 of the respective corners 25. Thus adjacent vertical rails 30a and 30b define a plurality of similar side openings 32 while adjacent vertical rails 30a (on adjacent base rails 20) define a plurality of similar corner openings 34.

The base rails 20 are extruded aluminum channels having an outer, vertically extending flange 36 to which the vertical rails 30a and 30b are secured, in a manner to be described. The inner side of the channels terminate in a longitudinally extending ledge 38 the extremity of which has a longitudinal groove 40 adapted to matably receive a leg of a decorative sill mold 42.

The vertical rails 30a and 30b are also extruded aluminum channels and include a relatively shallow channel portion 44 (see FIG. 13) and a centrally located longitudinally extending locking rib portion 46. The rib portion 46 is bifurcated at its outer end having a pair of leg portions 48 separated by a V-groove 50. The leg portions have straight, parallel extending surface portions 52 which terminate at locating surfaces 54. The upper and lower ends of the rib portion 46 are provided

with vertical grooves 56 and 58, respectively. Lower groove 58 is of sufficient length and depth so as to receive the flange 36 of the base rails 20. With the flange 36 located in groove 58, the vertical rails 30a and 30b can be fixed to the base rails 20 via fasteners 60 through aligned openings 62 and 64. The opening 64 in the flange 36 can be somewhat elongated vertically to assure that the vertical rails 30a and 30b are supported directly on the base rails 20 and not via shear load on the fasteners 60.

For a purpose to be seen, sealing and insulating strips 64 are located in the shallow channel portions 44 on opposite sides of the locking rib portion 46. The strips 64 can be in the form of pressure sensitive adhesive tape of butyl rubber. The next step is to install a plurality of the headers 66.

The headers 66 are a plurality of extended aluminum channel sections (see FIGS. 12, 13, 17 and 18). An outer leg 68 of the header 66 is adapted to fit within the upper groove 56 of the vertical rails 30a, and 30b with the assembly secured together via a fastener 70 extending through aligned openings 72 and 74. As can be seen, each header 66 is similarly secured to three vertical rails 30a, 30b, 30a. The confronting ends 76 (FIG. 18) of the headers 66 can similarly be angulated to provide matching ends which are further secured together via an attachment plate 78. The headers 66 define an octagonal shape similarly to the base rails 20 with corners 80 being in general vertical coincidence with corners 25. The headers terminate in an outer ledge portion 82 for supporting a ceiling structure 84 (shown in phantom in FIG. 12). The center post assembly 24 previously noted, can be mounted before or after the assembly of base rails 20, vertical rails 30a, 30b and headers 66. With the center post assembly 24 in place the roof support structure is assembled next.

The center post assembly 24 extends above the headers 66 to provide the roof structure with the proper slope. A flanged collar 86 (see FIG. 7) is secured near the top of a tubular post 88, which post 88 is in turn secured to the base plate 28. A hub 90 is rotatably mounted over the end of the post 88 via a hub portion 92 and is vertically supported by the flanged collar 86. The outer surface of the hub 90 is generally frusto conically shaped; a plurality of radial ribs 94 provide additional strength to the hub 90.

A plurality of lower corner rails 96 extend from the hub 90 to and beyond each of the upper corners 80 at the juncture of headers 66 (see FIGS. 4, 7, 10 and 17). The corner rails 96 are aluminum extrusions and comprise a longitudinally extending generally flat base portion 98 (see FIG. 10) and a centrally located locking rib portion 100; the rails 96 are secured at their inner ends by four fasteners 102, extending through the base portion 98, to the outer surface of the hub 90. At their outer ends the rails 96 are secured to the headers 66 via fasteners 104 (see FIG. 4). As noted the hub 90 is rotatably supported on post 88 and can be rotated to assure proper alignment of the corner rails 96 between the eight corners 80 and the hub 90. Centrally located between each pair of corner rails 96 are mid rails 106 (see FIGS. 9 and 17). Mid rails 106 are identical to rails 96 except that they are shorter in length and while extending beyond the headers 66 to the same extent as rails 96, they extend a lesser distance on the hub 90 and are secured there by only a pair of fasteners 108. The opposite end of rail 106 is secured to the headers 66 by fasteners similar to 104. In order to provide additional

support a plurality of box sectioned, tubular extruded aluminum struts 110 are utilized.

The post 88 has a sleeve assembly 112 secured thereto at a location below the hub 90 and at the same level, or slightly higher than the level of the headers 66. The sleeve assembly 112 has a plurality of circumferentially spaced, pairs of support plates 114 (see FIGS. 7 and 8). The associated pairs of plates 114 are spaced apart sufficiently to receive the inner end of the strut 110 which is pivotally supported therein via a shear pin 116. This permits the struts to be selectively angulated upwardly to the connection at the opposite, outer end. Gussets 118 are provided to increase stiffness and strength of assembly 112. Only eight struts 110 are utilized, one for each of the corner rails 96. Each corner rail 96 has an open U-channel section 120 secured to its underside at a selected location intermediate its ends (see FIGS. 3, 5 and 6). The opposite end of struts 110 is secured to the channel section 120 via a shear pin 122. The struts 110 define with the associated corner rails 96 an umbrella like structure. Hence a portion of the load on the rails 96 is taken in compression or column loading of the struts 110, whereby the rigidity and strength of the assembly are substantially increased. This increase in rigidity and strength is provided at no expense to interior room since the structure is at or above the headers 66 and hence at or above the ceiling 84.

Additional lateral support is provided by lateral supports 124 (see FIGS. 2, 6), which extend between and connect adjacent corner rails 96. Fastened to opposite sides on channels 120 are V-shaped brackets 126; while one leg of the brackets 126 is connected to the channel 120 the opposite leg is connected to the lateral support 124 via fasteners 128. With this structure all of the corner rails 96 are secured together at the intermediate location via the supports 124. Supports 124 are extruded, aluminum U-channels. The mid rails 106 are not secured to the supports 124 but can rest thereupon and hence be vertically supported thereby. In this way the struts 110 are able to provide vertical support not only for the corner rails 96 but also for the mid rails 106 via lateral supports 124. This now completes the first stage of construction, i.e., the assembly of the support structure 14.

Internal partitions or walls such as walls 130, 132, 134 can be made of conventional construction, i.e., studs, etc., and are preferably in place by this stage of construction. The next step is the assembly of the wall structure 16.

As noted the openings 32 defined between adjacent vertical rails 30a and 30b are uniform and corner openings 34 between two adjacent vertical rails 30a are uniform. Thus only two essentially different wall panels need be made, i.e., a flat panel 136 for straight openings 32 and an angulated panel 138 for corner openings 34. Flat panels 140 can be provided with openings for windows 142 and one or more openings 32 can be used to accommodate doors 144 and 146. Since the general construction of all of the panels is similar a description of one should be sufficient.

A section of one of the flat panels 136 is shown in FIG. 13. Panel 136 is formed with a rigid, foamed urethane core 148. The core 148 is molded onto a tough outer skin 150 of reinforced fiber glass; a suitable gel coat outer layer provides for a smooth decorative finish which is impervious to rain, etc. A gypsum wall board 152 is applied to the inside surface of the core 148; a

finished plywood or other decorative surface would be applied instead. Corner panels 138 are similarly formed with a uniform, one piece core and uniform one piece outer skin. The panel 136 is formed in a stepped construction at both its lower end and upper ends to fit within the base rails 20 and headers 66, respectively. Thus the outer surface of the panel 136 has an upper step 154 and lower step 156 adapted to fit between the vertical space 158 between the outer flange 36 of base rail 20 and the outer leg 68 of the header 66. The steps 154 and 156 are of a depth such that the outer surface of the panel 136 will be generally flush with the outer surface of the vertical rails 30a, 30b. The inside surface of the panel 136 terminates in an upper flange 160 and lower flange 162. As can be seen an air space is provided both at the upper and lower ends of panel 136 and header 66 and base rail 20. The panel 136 is assembled in an opening 32 between two vertical rails 30a and 30b by tilting the upper end and locating it within the channel defined by the header 66. Since at this time the decorative mold would not be installed yet the bottom end or lower flange 162 would be below the ledge 38 on base rail 20. The bottom end of the panel 136 is then moved towards the base rail 20 and the entire panel 136 is gradually raised until it slips into the defined space. The panel 136 is then vertically supported by engagement of the panel step 156 and outer base rail flange 36 and panel flange 162 and base rail ledge 38. The next step is to clamp two adjacent panels together at their confronting sides. The clamping structure can be seen in FIG. 11.

Thus in FIG. 11 two panels 136 have been assembled into openings 32 between associated vertical rails 30a, 30b. The outside peripheral surface of panel 136 is provided with an inwardly extending step 164 which receives one side of the shallow channel portion 44; a slightly raised portion 166 is provided to engage and compress the sealing strip 64 and hence to assure a tight seal. The same side of panel 136 has a laterally extending step 168 whereby an air space or cavity 170 is defined between adjacent panels 136. The inner edge of panel 136 terminates in an edge flange 172. When the two panels 137 are located in adjacent openings 32 the confronting flanges 172 are spaced a preselected distance to define a gap 173 for a purpose to be seen.

The locking rib portion 46 of vertical rail 30a extends into the cavity 170 and matably receives a locking rib 174 of a vertical clamping rail 176. The vertical clamping rail 176 is an aluminum extrusion of a length to be located in and over the gap 173 as it extends between base rail 20 and header 66. The groove 178 is of sufficient width to snugly receive the leg portions 48 with the end of the rib 174 bottoming out against the locating surfaces 54. A plurality of fasteners 180 extend through the rib 174 and into engagement with mating rib 46 between the leg portions 48 and assist in drawing the pieces together and maintaining a clamped condition. As can be seen the clamping rail 176 has a flat base portion 182 which extends sufficiently on opposite sides of gap 173 to properly distribute the clamping loads. A thin insulation film or coat 184 is located in the groove 178. This provides insulation between the vertical rail 30a and the associated clamping rail 176 such that heat transfer from the interior of the house via rails 30a and 176 is minimized. Note that the panels 136 are separated from each other by rails 30a, 30b and by the cavity 170. This spacing feature tends to isolate adjacent panels from each other and inhibits flame

spread from one panel 136 to another in case of fire. Thus the wall structure 16 has an anti-flame propagation characteristic.

The wall construction 16 provides several modes of running electrical wiring. In FIG. 12 a prewired conduit 184 and junction box 186 is molded into the urethane core 148. Upon assembly, an electrical outlet can be wired onto the junction box 186. The conductors 188 in conduit 184 extend out of the top of the panel 136 and can be led above the headers 66 via an opening 190. Thus all or a good portion of the wiring connections can be made conveniently above the ceiling 84. Additionally or alternatively conductors 192 and 194 can be located in the cavity 170 (see FIG. 11) and thence connected to switches, outlet, etc., at one end and fed up beyond the heads 66 for electrical connection at the opposite end. With the house assembled thus far what remains now is the roof structure 18.

The roof structure 18 comprises a plurality of pie shaped roof panels 196 (see FIGS. 10 and 14) which are adapted to be located between and supported by a corner rail 96 and an adjacent mid rail 106. The panels 196 can be made of a heavy gauge reinforced fiber glass; the outer surface can be an integrally formed gel coated finish or other desirable, suitable finish and can be formed to simulate shingles, etc. Each side of the panels 196 has a longitudinally extending channel 198 extending laterally from a vertically depending leg 200. The leg 200 is located and supported upon the base portion 98 of rail 96 (and/or the similar base portion on mid rail 106). The roof panel 196 is then clamped to the rails 96 and 106 via a clamping rail 202. Clamping rail 202 has a shallow channel portion 204 having opposite legs 206 adapted to be received in the channels 198. Rail 202 has a central rib portion 208 which is similar to rib portion 46 of vertical rail 30a (see FIG. 11) while the locking rib portion 100 of corner rail 96 is similar to locking rib portion 174 of clamping rail 176 (see FIG. 11). Hence the corner rail 96 and clamping rail 202 are locked together via fasteners 210 thereby clamping the roof panel 196 in place. An extruded aluminum I-beam 212 is secured near the outer end of the roof panel 196 in a location such as to engage the headers 66. The I-beam 212 can then be fastened to the headers 66 via fasteners 214 (see FIG. 12). The I-beam 212 can be glassed onto the roof panel 196 after the panel 196 has been formed. A soffitt 216 can be integrally formed with the roof panel 196.

A cap 218 is provided with a plurality of slots 220 (see FIGS. 7 and 19) to receive the radially inner ends of the roof panels 196. Note that the outer surface of the roof panels 196 is generally flush with the clamp rail 202 giving the roof a uniform appearance. This now completes the assembly of the roof structure 18 and hence completion of the house assembly 10 per se.

The ceiling 84 can be of a conventional suspended ceiling construction providing easy access to the area above.

Ventilation of the ceiling space can be provided from appropriate openings in the soffitt 216 and roof openings underneath the cap 218.

Note that the wall panels 136 are not load bearing and hence can be easily removed. This feature provides great flexibility in repairing or replacing damaged panels, seals, etc., or rearranging panels to relocate a window, etc.

The result of all of the above is an inexpensive, easy to assemble house which is adaptable for essentially

most climactic conditions.

While it will be apparent that the preferred embodiments of the invention disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the invention.

What is claimed is:

1. A house construction comprising wall structure means for enclosing the sides of the house; roof structure means for enclosing the top of the house; a foundation for the house construction and support structure means mounted on said foundation and operatively connected with said wall structure means and said roof structure means for supporting said wall and roof structure means; said support structure means including a plurality of longitudinally extending base rails, said base rails being arranged in a polygonal shape of greater than three sides with junctures of pairs of said base rails defining base corners, a plurality of vertical rails supported on and secured to a plurality of said base rails, said plurality of vertical rails being generally uniformly spaced along each of said plurality of base rails and spaced away from associated ones of said corners, adjacent vertical rails on said base rails defining uniform generally planar openings, adjacent vertical rails on adjacent base rails defining uniform angulated openings, a plurality of headers connected together and connected with the upper ends of said vertical rails and arranged to define a polygonal shape similar to that defined by said base rails with the junctures of adjacent headers defining upper corners, a vertically extending center post assembly supported on said foundation and located generally centrally with respect to said base rails and said headers, said center post assembly having a rotatable hub supported proximate the upper end of a vertical center post, said hub located at an elevation above said headers, a plurality of corner rails extending radially from said hub to each of said upper corners, an

intermediate rail located between said corner rails and extending radially from said hub to said headers.

2. The house construction of claim 1 with said support structure means with said center post assembly having a sleeve assembly located below said hub, a plurality of struts, first support means pivotally supporting one end of each of said struts to said sleeve assembly, second support means pivotally supporting the opposite ends of each of said struts to one of said corner rails.

3. The house assembly of claim 2 with said support structure means further comprising lateral supports connected between adjacent corner rails and supporting said intermediate rails.

4. The house assembly of claim 1 with each said base rail being a channel section having a flat base portion, an elongated flange portion at one end of said base portion and a flat, ridge portion of reduced height relative to said flange portion at the opposite end of said base portion, said ridge portion terminating in a longitudinally extending groove portion adapted to receive a sill mold.

5. The house assembly of claim 1 with each said vertical rail comprising a shallow, channel portion and a centrally extending rib portion; locking means located at the extremity of said rib portion for cooperating with a mating rib portion on another member for securing said vertical rail to the other member.

6. The house assembly of claim 1 with each corner rail having a flat base portion and a longitudinally extending rib member fixed to said base portion, locking means located at the extremity of said rib member for cooperating with a mating rib portion on another member for securing said corner rails to the other member.

7. The house construction of claim 1 with said roof structure means comprising ventilating means for providing air circulation, said ventilating means comprising a central opening at said center post assembly and other openings located radially outwardly therefrom.

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