

May 26, 1970

W. NAGROD

3,513,608

CURVILINEAR PREFABRICATED BUILDING WITH CONICAL ROOF

Filed Nov. 20, 1968

3 Sheets-Sheet 1

Fig. 1.

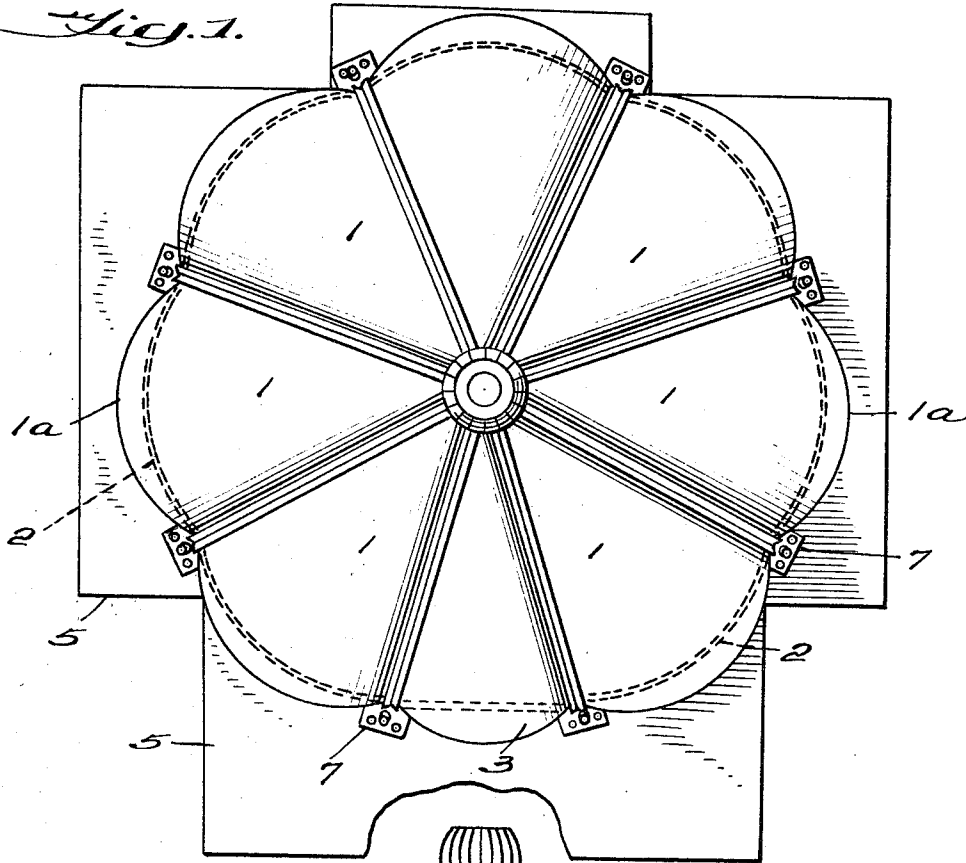
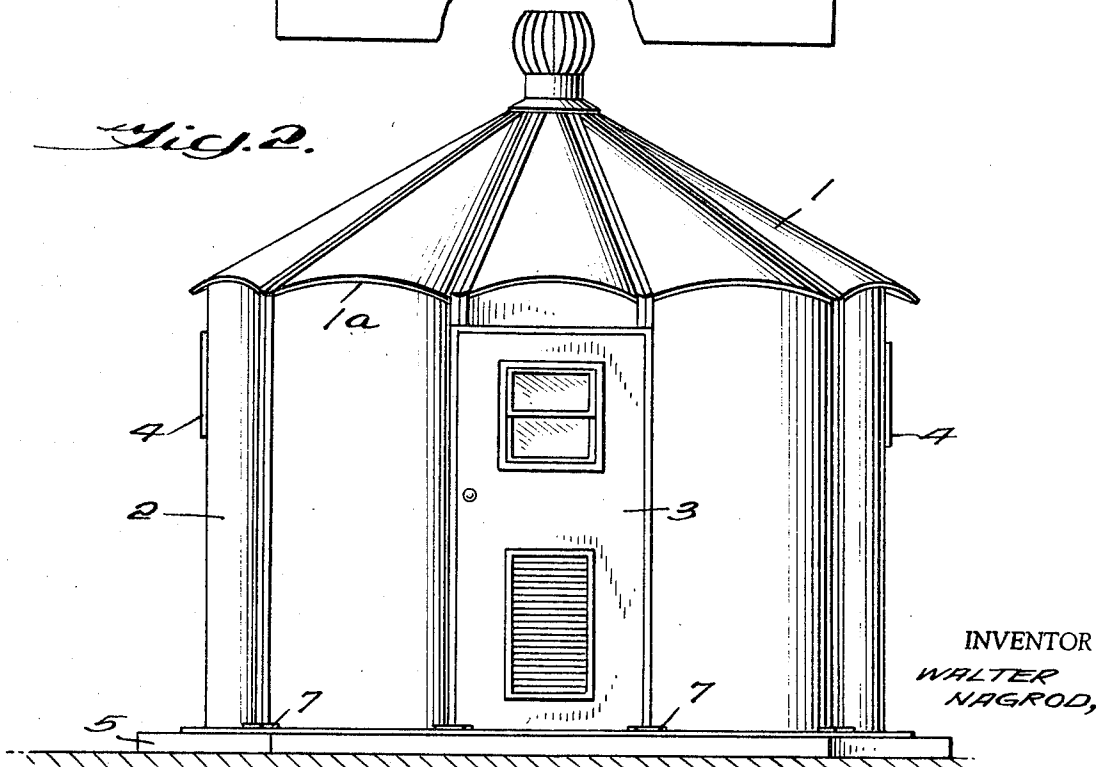


Fig. 2.



INVENTOR
WALTER
NAGROD,

BY

J. Austin Stone
ATTORNEY

May 26, 1970

W. NAGROD

3,513,608

CURVILINEAR PREFABRICATED BUILDING WITH CONICAL ROOF

Filed Nov. 20, 1968

3 Sheets-Sheet 2

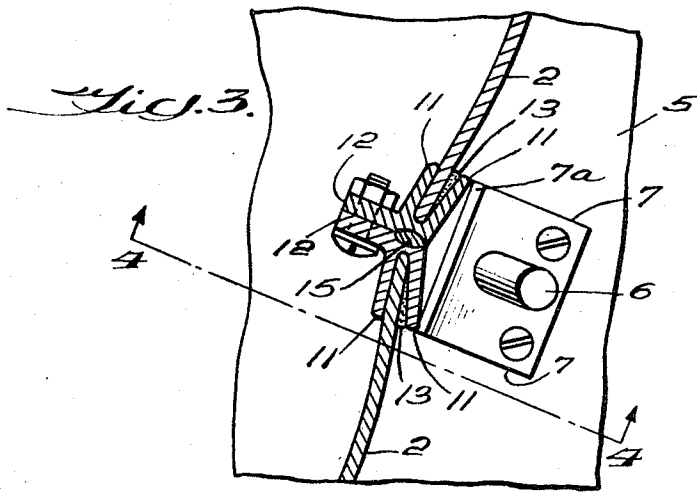
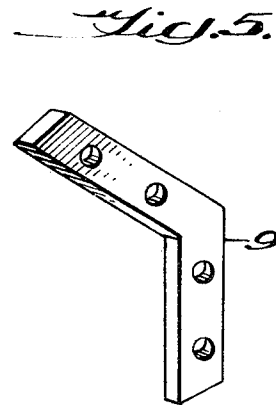
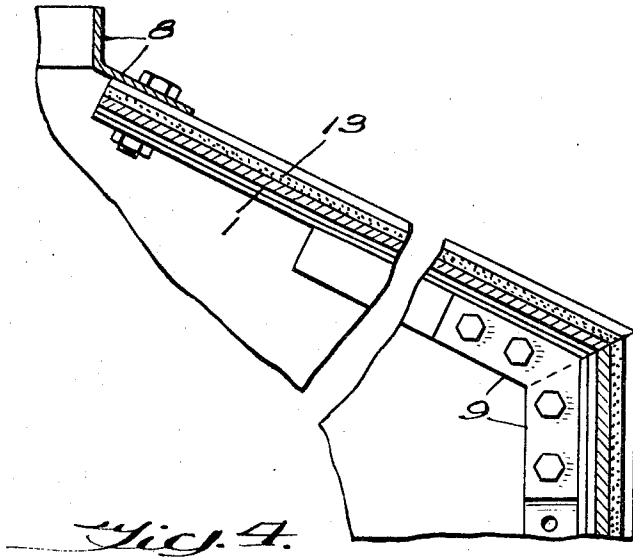
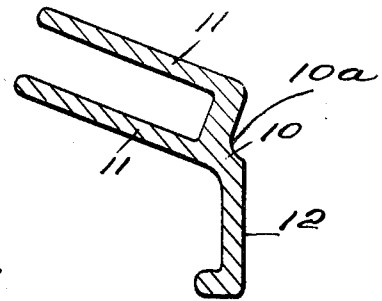
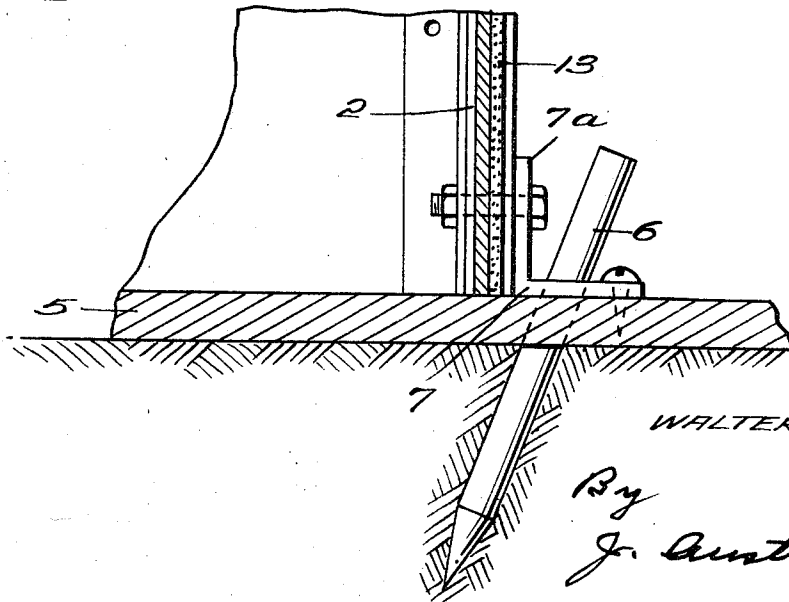


Fig. 6.



INVENTOR
WALTER NAGROD,

By
J. Austin Stone
ATTORNEY.

May 26, 1970

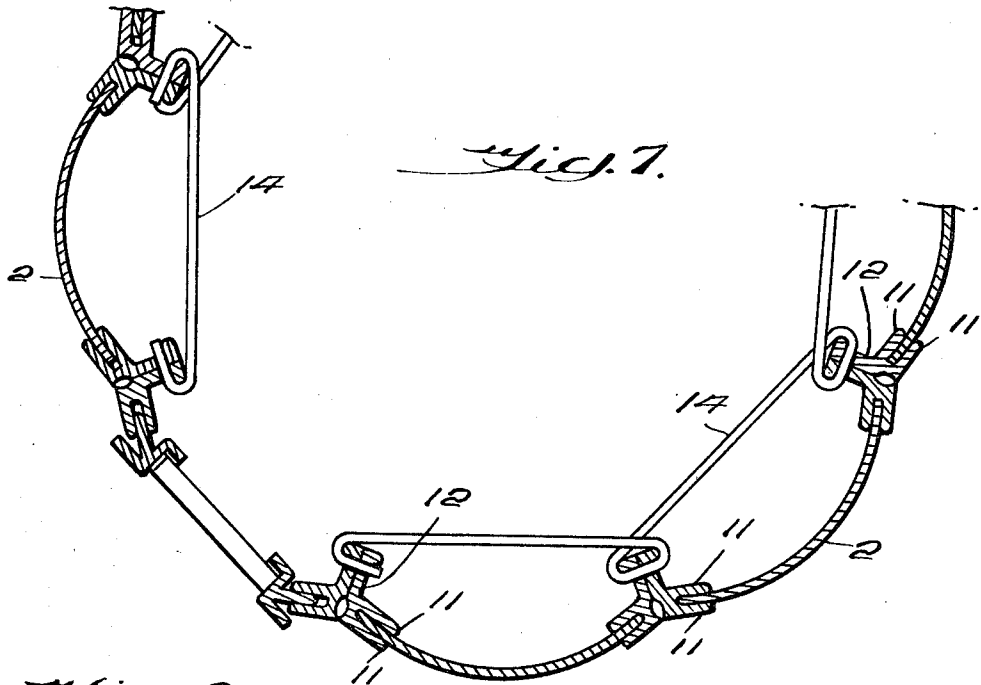
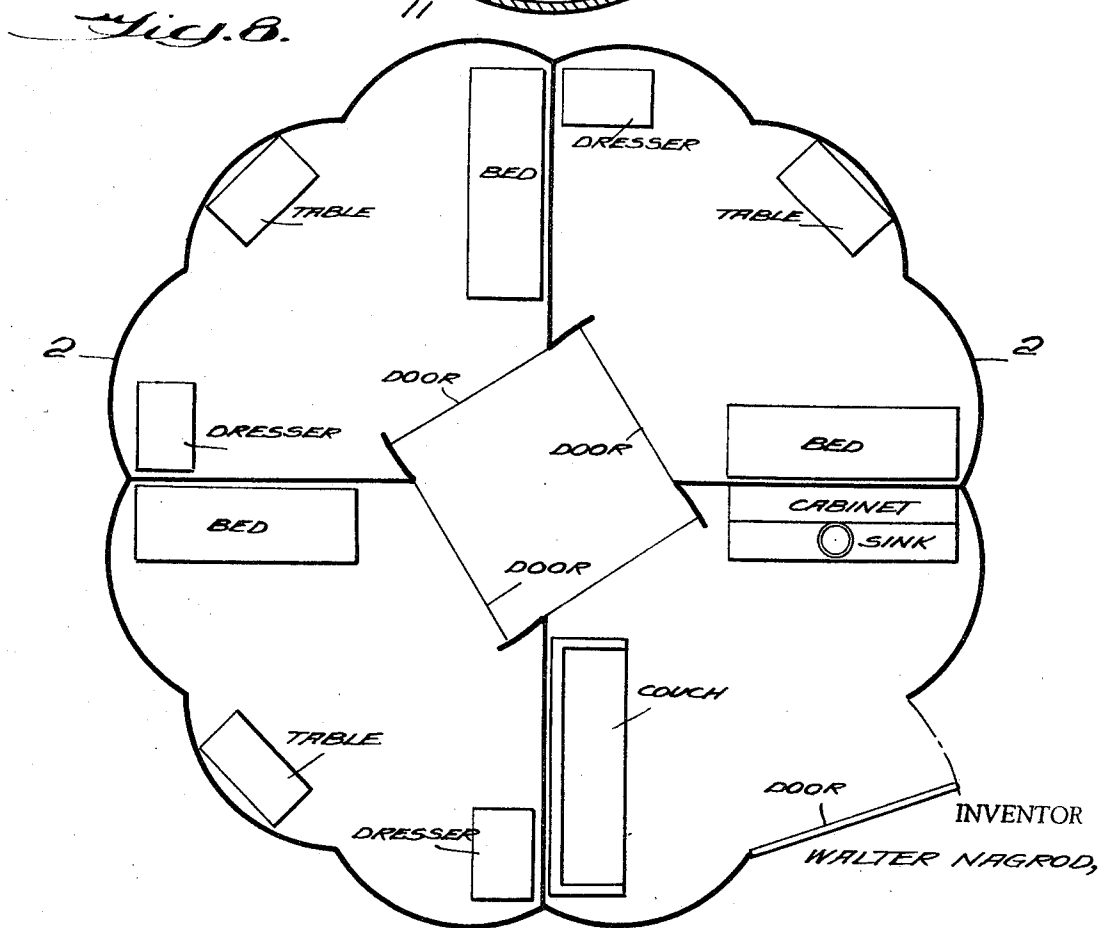
W. NAGROD

3,513,608

CURVILINEAR PREFABRICATED BUILDING WITH CONICAL ROOF

Filed Nov. 20, 1968

3 Sheets-Sheet 3



BY

J. Austin Stone
ATTORNEY,

1

3,513,608

CURVILINEAR PREFABRICATED BUILDING WITH CONICAL ROOF

Walter Nagrod, Alexandria, Va.

(7804 Atwood St., Apt. 5, District Heights, Md. 20028)
Continuation-in-part of application Ser. No. 652,873,
July 12, 1967. This application Nov. 20, 1968, Ser.
No. 778,019

Int. Cl. E04b 7/00

U.S. Cl. 52—82

3 Claims

ABSTRACT OF THE DISCLOSURE

This invention is directed to a house of relatively simple construction for quick installation and for temporary or permanent use, the elements of which lend themselves to easy construction and a composite building when completed which possesses inherent strength and resistance to storm elements. Each house is formed of a series of side panels extending upward with the lower ends of the panels secured to a base and each panel secured to its adjacent side member. The panels are peculiar in that they can be and preferably are formed of relatively thin flat sheets possessing natural rigidity, which sheets are, while being incorporated in the house, subjected to tension providing them with lateral curvature with the result that the assembly of the upright side panels provides a series of arcuate panels, the total assembly of which possesses strength and resistance to storms and lateral movement.

The panels, together with the holding members preferably of extruded aluminum, which receive and embrace the side edges of the panels to hold the panels under tension, embody a vital feature of the invention.

This application is a continuation-in-part of application Ser. No. 652,873, filed July 12, 1967, and entitled "Single-Walled Modular Stressed Panel Structures," and now abandoned.

This continuation-in-part application is directed generally to the broader phases of the house construction which was presented in the parent application but includes certain improvements to which this specification will also be directed.

As in the specification of the parent application, the house of this invention is directed to the use of a series of side panels extending upward with the lower ends of the panels secured to a base and each panel secured to its adjacent side holding member. The panels are formed of relatively thin flat sheets possessing natural rigidity which are subjected, while being incorporated in the house, to tension to provide each panel with lateral curvature with the result that the assembly of panels provides a series of arcuate panels, the total assembly of which possesses strength and resistance to storms and lateral movement.

Incorporated with the panels to receive their lateral edges and to hold them under tension is a rigid holding member which preferably extends the full length of each panel to receive and embrace the side edge of the panel. Preferably also this holding member is of extruded aluminum or other material having two arms extending from a third arm and possessing rigidity and adapted to receive the side edge of the panel between the two arms. A third arm of the holding member is adapted to be held fixedly.

The panel material may be of any flexible but fairly rigid material such as fiber hardboard, fiber glass, plastic, plywood, sheet metal flat or corrugated which can be curved and placed under tension.

The following are the principles of the method and fabrication and assembly of the essential elements of the house of this invention. For example, using a fiber hardboard 1/8 inch thick by 4 feet wide by 7 feet high for

2

the material of a vertical panel section, the upper end portion is scalloped to a predetermined radius. The radius of the scallop of the top of the vertical wall panel is determined by the curvature of the roof panel. The next step is the provision of a specially designed holding member to be bonded to the opposite edges of all of the wall and roof materials for the purpose of holding the panels under tension. This holding member may be of any suitable rigid material such as aluminum, steel, wood, plastic, but preferably of extruded aluminum. This holding element for embracing the lateral edge of each panel is provided with spaced substantially parallel arms between which is a channel to receive the edges of the panels. Said arms are set off at a specific angle from a third arm and preferably at an oblique angle from the third arm. The third arm is designed to be held rigidly so as to anchor the arms of the channel.

When the edge portion of the panels is received in the channel, the direction of the panel as it extends from the arms of the channel is at an angle from said arms with the result that between one of the arms and the panel member there is a slight space which serves satisfactorily for the reception of caulking, bonding, or waterproofing.

All of the upright panel members are cut to exactly the same length and are drilled to accept, for example, 1/4 inch bolts every 12 inches apart, and at the bottom with holes to fasten the wall panels to a floor bracket previously fastened to the floor. The bottom of each upright holding member is cut square but the top of each holding member is cut at a specific angle to match up with the roof holding member so as to correspond at a correct roof pitch.

The upper end of each wall panel holding member is provided with two holes spaced one inch apart for attaching a mounting plate extending at an angle from the wall panel to support the lower end of roof panel members.

All of the aluminum roof panel edge supporting holding members are cut to the same length, the upper cut being square and the bottom cut being at a predetermined angle to match the same angle as provided by the upright panel wall holding members. Likewise the top holes are drilled to fasten to a steel ring at the peak of the roof, and holes along the flange of the holding member are drilled for 1/4 inch bolts for securing roof sections together. At the bottom of each holding element twin holes one inch apart are provided for accepting the bolting of the mounting plate.

After all of the wall materials have been scalloped at the top, the holding member is cut and drilled and the next step is to bond the wall material into the channel of the holding member arms with a waterproof and long lasting bonding adhesive. When the adhesive is firmly dried, the wall panels are ready to be coated with a good waterproof solution.

In conformity with the foregoing general outline, the invention will be discussed and further described in conjunction with the several views of the drawings, in which:

FIG. 1 shows a top plan view of a house conforming to the title of this invention, specifically single-walled modular stressed panel structures;

FIG. 2 is a side elevation looking at the door panel section;

FIG. 3 is a sectional view looking down on the plate for securing the house to a base;

FIG. 4 is a view taken on line 4—4 of FIG. 3 looking at the edge of the base plate shown in FIG. 3;

FIG. 5 is a view of the mounting plate for securing the upper end of the wall panel holding member to the lower end of the roof holding member;

3

FIG. 6 is a cross sectional view of the holding member having a channel between parallel arms;

FIG. 7 is a fragmentary view of the type of construction shown in FIG. 3 of the parent application Ser. No. 652,873 for maintaining tension on the upright panel elements; and

FIG. 8 is a view of a suitable floor plan according to which the interior of the house is divided into different rooms, also similar to the plan shown in the parent application.

Referring in detail to the several figures of the drawings, 1 indicates the sector shaped roof panels. 1a represents that lower edge portion of the roof panels extending beyond the wall of the upright panels 2. The front door panel 3 is slightly more narrow than the associated upright panels. The door is shown as flat for lying in one plane as contrasted to the curved shape of the associated panels 2.

Windows 4 are indicated in FIG. 2. 5 indicates the floor of the house which may be provided by the surface of the wooden box members in which the packaged material of the house may be shipped. That wooden floor may be mounted on any other material or if so desired the base material may be of concrete having bolts embedded in the concrete and extending upwardly for engagement with the floor bracket now to be described.

The house may be secured to a foundation whether it be of plain earth or other material by means of a spike 6 which is driven downwardly diagonally, as shown in FIG. 4, through the bracket member 7 which has an upwardly extending flange 7a adapted to be bolted to the lower portion of the panel holding members, as indicated in FIG. 4.

At the peak of the roof a collar member 8 has a lower portion to which the upper edge of the roof panels may be secured and a vertical portion serving as a vent, the walls of which provide for the attachment of any suitable vent or decorative units. The collar member 8 should be of steel and sturdy.

The element 9, as shown in FIGS. 4 and 5, is an angle piece adapted to connect the upright panel elements with the roof structure. This element 9 is preferably cast aluminum.

FIG. 6 illustrates a cross sectional view of the holding member 10 which is adapted to receive in the channel between its parallel arms 11 the edge of the panels 2 to hold them under tension. The element 10 has a third arm 12 from which the arms 11 extend obliquely. The arm 12 is adapted to be held fixedly to any fixed supporting member. According to FIG. 3, it will be observed that the arms 11 receive between them the edge of the panel 2 and that there is a slight space between the panel 2 and one of the arms into which there may be introduced a bonding material 13.

In FIG. 6 a recess 10a is shown in the wall of the holding member 10. This wall is on the side of the holding member opposite to the channel and when the holding members are placed back to back, as in FIG. 3, the combined recesses of the two holding members forms a space for the reception of a caulking bead 15. This is particularly pertinent to the construction of the roof, as will be explained. It is illustrated in FIG. 3.

FIG. 7 illustrates the holding bar 14 of the parent application Ser. No. 652,873 which is used for holding the panels 2 under tension. It will be observed that the return bend of the tension member 14 extends through the third arm 12 of the holding member 10 and that the arms 11 are shown in FIG. 7 for precisely the same purpose as in FIGS. 3 and 6.

FIG. 8 shows how the interior of a house of this construction may be divided into rooms for a variety of purposes.

In the foregoing, there has been set forth a description of the essential features of this new house. For such

4

additional information as may be useful, the following erecting procedure is set forth:

(1) Lay out the circle and dimensions on the packing case sides or such other broad area. Directions and specifications will be enumerated on instruction sheets shipped with each house.

(2) Fasten floor brackets in place according to where the panel end edges should be located.

(3) Fasten door section upright to the floor brackets. Since the door section is not stressed, i.e. curved, but is in a flat plane, it has upright members onto which to fasten the adjoining wall panels through the holes provided in the flanges, spaced arms 11.

(4) Working on the inside from right to left, insert all of the bolts through the holes to attach a panel to the door section, except for the top two holes. These holes are reserved for the attachment of the mounting plates 9 as shown in FIGS. 4 and 5.

(5) The mechanic now compresses with his knee the 48 inch panel to be attached to the inside of the next floor bracket and secured with a bolt. This will now compress the panel to a 45 inch cord.

(6) Using the next panel, line it up with the holes of the panel just erected in item (5), and insert again all of the bolts except the top two, and fix firmly with the nuts provided.

(7) Continuing this procedure, the panel with the window louvre or whatever cutouts are desired in whatever sequence it is desired, the final panel should be fastened to the opposite side of the door. The resultant structure now has the shape denoted by the dotted lines in FIG. 1 of the drawing. The compressed panels press against each other and do not depend on the adhesive at 13 (see FIG. 3) for strength. It must be obvious that a 48 inch panel, compressed to a 45 inch cord and confined by the geometric design of the holding members (FIG. 6) sets up a unit of tremendous strength and holding power.

The roof diagram shows all of the wedge shaped sections are alike except for one over the door. The roof panels at the wide part are, again as in the wall panels, 48 inches wide. A scalloped radius is extended along the circle of the wall sections so as to create an overhang and also to enhance the eye appeal.

ASSEMBLING THE ROOF

The following further instructions pertain particularly to the assembling of the roof.

A bead of caulking 15 is run into the recess provided between the opposed curves 10a of the adjacent holding members. Next another section of roof panel is placed in position alongside of the previously mentioned roof panel and the holes and bolts are lined up with the roof sections together but leaving the bottom two holes for bolting to the mounting plate 9 (FIG. 5). In order to bolt both of these two roof panels to the mounting plate, a second person is needed to hold the peak of the panels high enough to match up the pitch of the mounting plate. If a second person is not available, then a long pole can be clamped to the upper end to hold up the weight. Bolts are now inserted into holes provided in the mounting plate 9 and nuts are fastened to secure it in place.

A bead of caulking is now run in as before and the next roof panel is bolted to that section already in place. It will be noted that in order to insert bolts into the next mounting plate, the roof panel must be pulled down over the scallop provided on the vertical wall panel. This action puts the roof panel into stress. It provides strength against snow loads and pulls together both the roof panels and the wall panels into identical 45 inch cord.

When all the roof panels are in place and bound together by the holding members and the mounting plates 9, and the ring at the top binds together the upper ends of the panels so that they cannot separate, the structure is put to test. It might be assumed that by placing a weight on the peak, the peak would be caused to lower or sag.

5

However, if the peak lowers, then the upper perimeter of the house should expand, that is the diameter should increase. Nevertheless the 45 inch cord cannot become greater, as for example 46 inch cord, unless the crown of each of the stressed roof panels lowers in order to broaden the length of the cord. But this cannot happen because the scallop of the vertical wall panel is holding it up, and it cannot possibly be lowered. This is the reason stress bars are not needed and the roof will stand up unsupported, rigid and strong.

The steel ring, which is number 8 in the drawing at the peak of the roof, must be of sufficient thickness and strength to firmly retain all of the aluminum holding members properly aligned in position and pitch. This construction also will prevent all aluminum holding members 10 from pushing outwardly.

The following steps and features in the foregoing construction should be observed:

(1) The aluminum holding member 10 and its associated holding member are designed to have the arms 11 extending at a special angle to throw the wall panels into a specific curve.

(2) The upper end of the vertical wall holding member is cut to a specific angle which again matches the angle of the lower ends of the roof holding members.

(3) The roof panel material is provided with a special arch by the degree of angle in the arms 11 of the holding member.

(4) The curvature of the roof arch panel is determined by the radius of the scallop of the vertical wall panels.

(5) The radius of the wall scallops supports the arch of the roof panel and prevents it from sagging and extending the cord beyond the example, 45 inch cord, chosen.

(6) The mounting plates 9 establish the relation between the fixed perimeter and fixed diameter and at the same times throws the roof holding members in a fixed upward pitch.

(7) The strong steel ring 8 at the peak pulls together all roof panel holding members.

The foregoing is believed to present sufficient explanation to enable a capable workman to assemble the house. Working explanations to facilitate the workmen will embody details for the assembly of the roof and also for the description of the geometric configurations which bind this structure into a new and unique unit. Instructions will also be provided as to how the steel peak ring 8 is incorporated.

Windows, doors, louvres, ventilating turbines, chimney caps, flooring, interior or exterior decorating are not basic with this structure and can be adapted to customer's wishes and finances. One of the desirable features of this house construction is that it can be prefabricated, pre-drilled and packaged in a flat condition at the factory in convenient four foot by eight foot plywood boxes and the plywood can be used as the flooring 5 with all of the holes pre-drilled to accept the floor brackets 7 so that a diameter layout is not necessary to initiate the assembly.

Since the product is circular, it can withstand wind forces of greater velocity since the essential surfaces are not flat. Winds tend to build up pressures against flat surfaces. This eliminates the need for heavy reinforcements, heavier wall materials and higher costs.

The following are the recommended uses of this type structure:

Fiber glass for greenhouses, vegetation cubicles for government air pollution studies, cabanas or pool side dressing rooms or pool covers, and enclosures.

Aluminum or steel wall material for storage of heavy machinery and equipment.

Fiber hardboard bonded and weatherproofed against water and mildew, for use in Vietnam etc. refugee housing, job corps, disaster areas, nurses sleeping quarters in epidemic areas, geological survey expedition headquarters. Large structures can be divided into several

6

rooms, with bath and kitchen facilities as beach houses, hunting and camping lodges.

For temporary set-ups, the common hardware store variety caulking is recommended along the bottom perimeter, inside and outside, to seal wall panels to the floor to keep out bugs, water, etc. Also at the juncture of side walls and roof where the wall "scallop" meets the roof and also in caulked recess 13 shown in FIG. 3. This caulking breaks apart more easily when it is ready to be disassembled.

For permanent housing and for use all year round and for years to come, the same bonding adhesive that binds the wall material into the channel between the arms 11 of the holding member will be supplied to bond the base of the walls to the floor and the juncture where the side wall scallop meets the roof. This adhesive is so strong that wood or fiber board will sometimes break before the adhesive breaks.

I claim:

1. A prefabricated building structure comprising a base, a plurality of brackets secured to said base, said brackets being spaced apart and disposed in a generally circular array on said base, a generally circular wall positioned on said base and projecting upwardly therefrom, said wall comprising a plurality of elongated flexible panels positioned in edge-to-edge, connected relationship, each panel having means joined to the opposed vertical edges with the adjacent means on contiguous edges being joined together, the lower ends of the joined together means being secured to said brackets, each panel being bowed outwardly between its vertical edges to a generally arcuate cross-sectional configuration, a generally conical roof disposed on the wall, said roof comprising a plurality of circularly disposed supports secured to the upper ends of said means and extending in upwardly converging relation to an apex, upwardly arched flexible roof panels secured between said spaced supports, the lower edges of said roof panels projecting beyond said wall and constituting an overhang, the outward curvature of said wall panels corresponding to the upward curvature of said roof panels at the intersection thereof whereby a substantially line contact is provided between the wall and roof panels at said intersection.

2. The building structure of claim 1 wherein each said means comprises an elongated element having a pair of parallel arms joined by a web and a third arm projecting from said web in coplanar relation thereto and at an angle to said pair of arms, said web and pair of arms enveloping the edges of said wall panels and the third arms of contiguous means being connected together.

3. The building structure of claim 1 wherein the apex of said roof includes a collar secured to said roof panels and spaced supports and a ventilator attached to said collar.

References Cited

UNITED STATES PATENTS

2,664,177	12/1953	Hammitt	52—283
2,705,349	4/1955	Shaw	52—81
3,137,097	6/1964	Zeinetz	52—80
3,199,258	8/1965	Zentoft et al.	52—222
3,254,462	6/1966	Toler	52—222
3,255,560	6/1966	McClenahan	52—93
3,386,220	6/1968	Staats	52—495

FOREIGN PATENTS

210,993	5/1956	Australia.
733,589	7/1932	France.
1,215,175	11/1959	France.
664,405	1/1952	Great Britain.

HENRY C. SUTHERLAND, Primary Examiner

U.S. Cl. X.R.

52—93, 199, 222, 246