

June 25, 1968

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3,389,514

TUBULAR FRAME SHELTER

Filed June 3, 1966

3 Sheets-Sheet 1

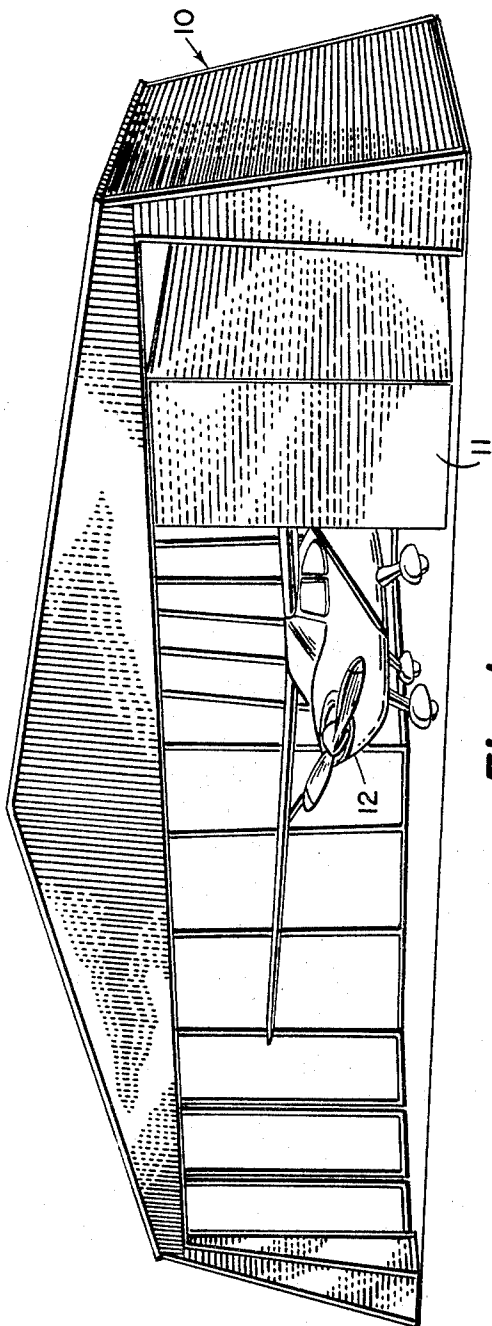


Fig. 1

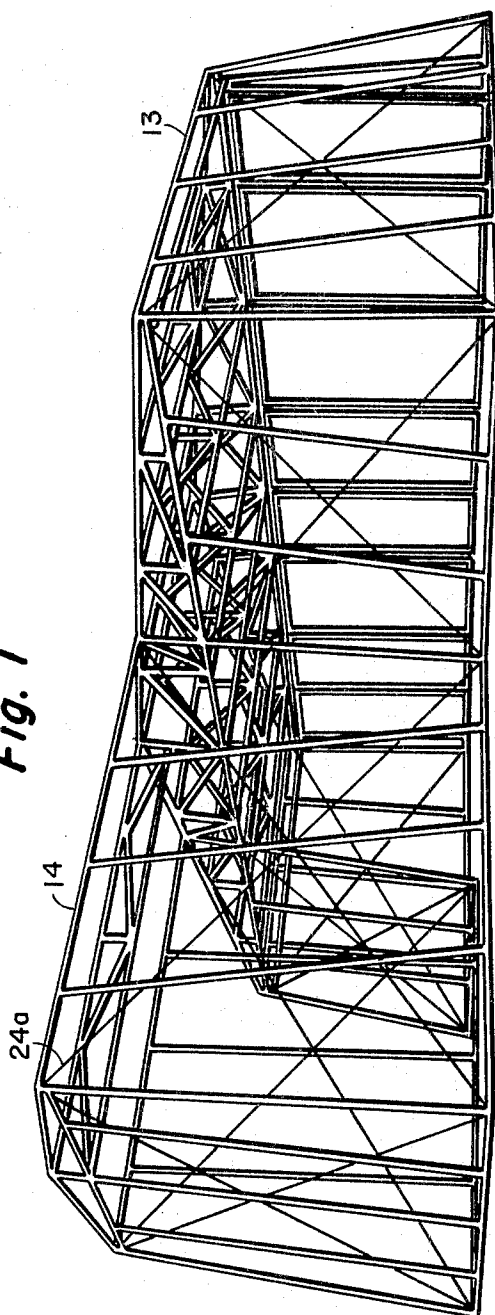


Fig. 2

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3 Sheets-Sheet 2

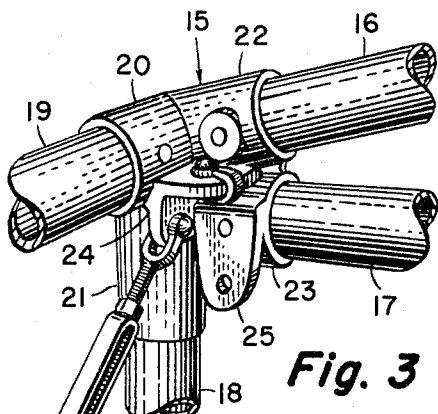


Fig. 3

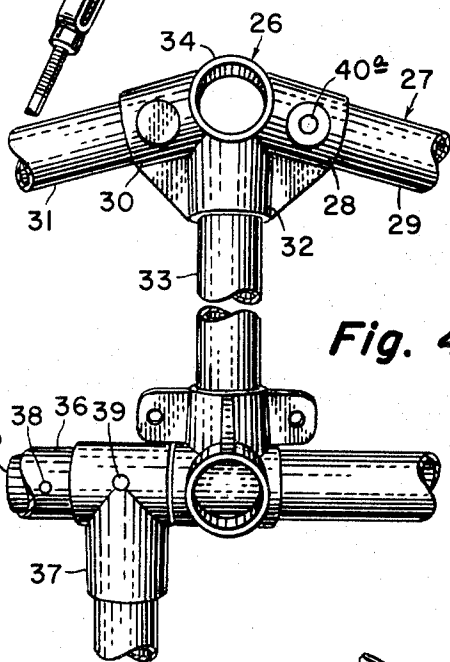


Fig. 4

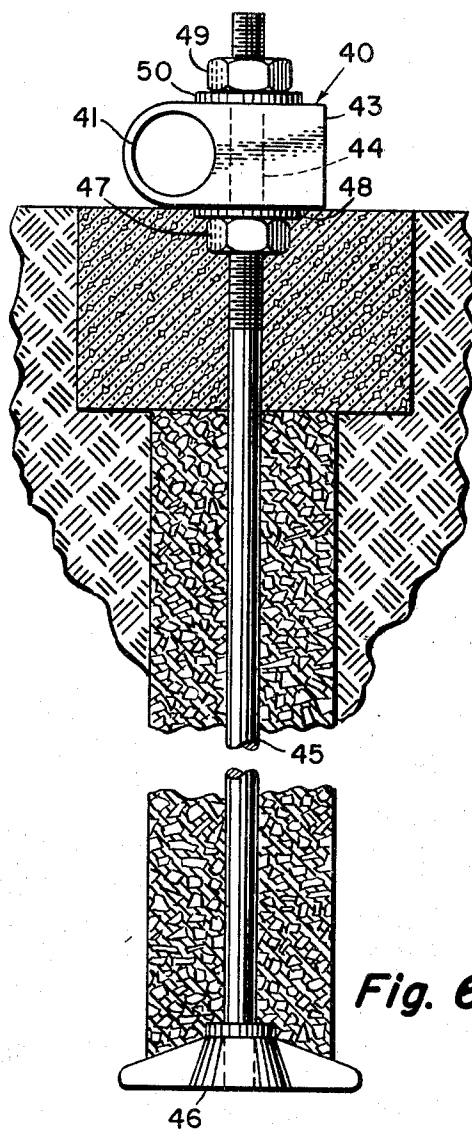


Fig. 6

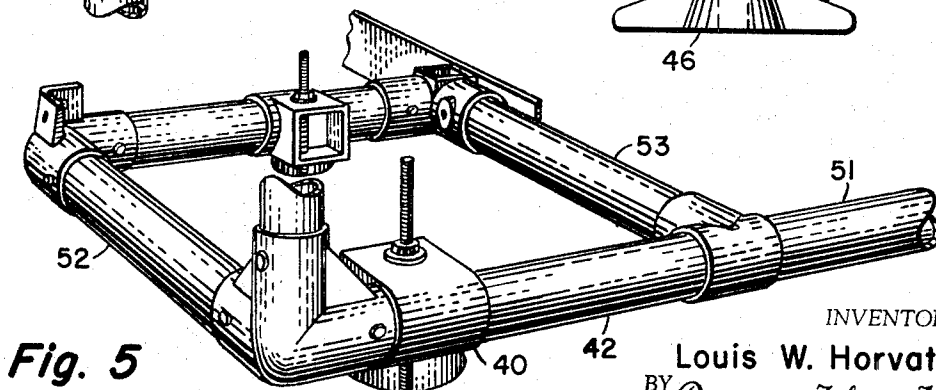


Fig. 5

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3 Sheets-Sheet 3

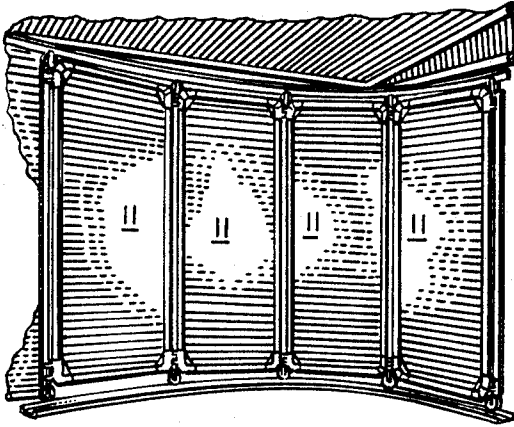


Fig. 7

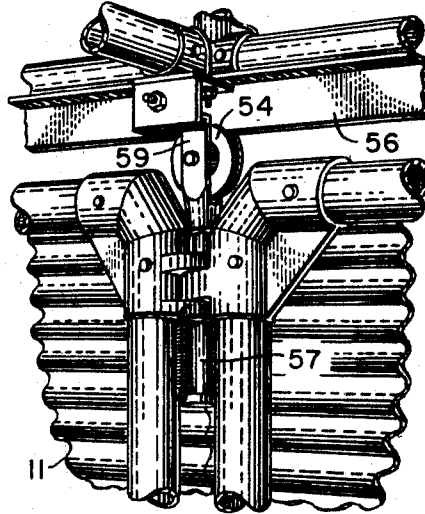


Fig. 8

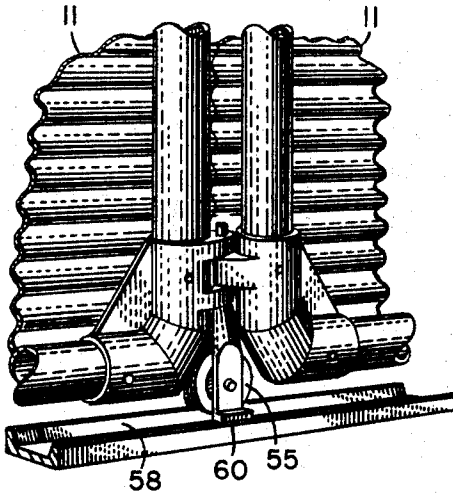


Fig. 9

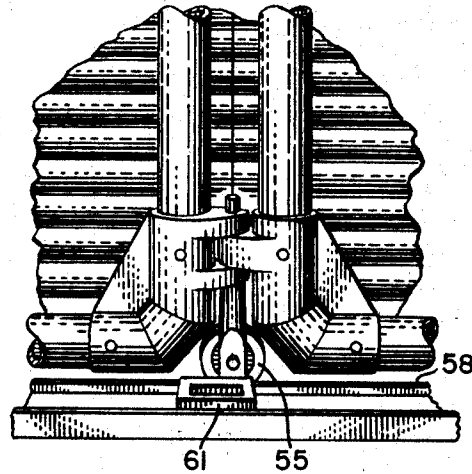


Fig. 10

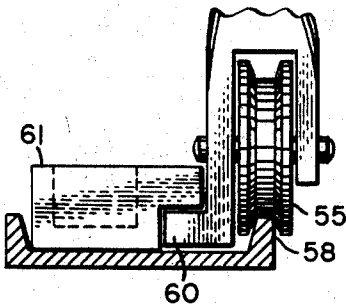


Fig. 11

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3,389,514

TUBULAR FRAME SHELTER
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Continuation-in-part of application Ser. No. 297,527,
July 25, 1963. This application June 3, 1966, Ser.
No. 555,109

4 Claims. (Cl. 52—90)

ABSTRACT OF THE DISCLOSURE

A tubular frame structure consisting of a plurality of tubular members generally end-connected to define side-wall supporting means and roof-supporting trusses. Four tubular members are connected at each truss corner by a four-receptacle fitting, and four tubular members are connected to define the truss ridge by another four-receptacle fitting. The tubular members are secured in the fittings by pins which extend through aligned openings in the members and fittings.

Background of the invention

This invention relates to a tubular frame shelter and, more particularly, to a shelter uniquely constructed of tubular members integrated to provide frames for supporting sidewalls and a roof whereby the structure can be quickly erected to provide shelter for storage of airplanes, appliances, and other matter requiring substantial space.

This invention is a continuation-in-part of my copending application Ser. No. 297,527, filed July 25, 1963, now U.S. Patent No. 3,270,755.

The invention finds particular utility in connection with the storage of airplanes and therefore I describe the invention in connection with that particular environment. It will be appreciated, however, that other objects can be advantageously stored in the shelter. However, the use in the airplane storage environment illustrates fairly well the problems which have faced the prior art and which are solved by the instant invention. These problems can be posed best in the form of the dilemma that faced the prior art workers. On one hand, the housing or shelter was required to be sturdy, well-anchored, and adapted to withstand the rigors of inclement weather. Airplane storage is particularly required along the gulf and coastal regions of the United States and as such, shelters must be able to withstand hurricanes.

The other horn of the dilemma is the matter of cost, ease of erection, possibility of relocation and all the other economic and practical factors that go with the housing of small airplanes. Through the practice of my invention, this dilemma is resolved and the provision of a structure which meets this requirement constitutes an important object of the invention.

The invention includes the use of unique fittings for integrating tubular or pipelike members at the truss corners and truss ridge which serve to integrate the structure into one that is sturdy yet economical and easy to erect. The provision of such fittings in a structure of the character described constitutes another important object of the invention.

Other objects and advantages of the invention may be seen in the details of construction and operation set down in this specification.

The invention is explained in conjunction with an illustrative embodiment in the accompanying drawing, in which:

FIG. 1 is a perspective view of a completed hangar constructed according to teachings of this invention;

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FIG. 2 is a perspective view of the erected framework making use of the inventive connections;

FIG. 3 is a fragmentary perspective view of the cast fitting used to integrate the truss corners with the side-wall framing members;

FIG. 4 is a fragmentary perspective view of the fitting and associated tubular members used in developing the truss ridge;

FIG. 5 is a fragmentary perspective view of the portion of the framing used to anchor the framing to the ground;

FIG. 6 is a fragmentary sectional view showing the installed anchor of FIG. 5;

FIG. 7 is a fragmentary elevational view as seen from the inside of the hangar with the doors in stored, partly open position;

FIG. 8 is an enlarged elevational view of the interior of the doors and showing the upper portion thereof in enlarged scale;

FIG. 9 is a view similar to FIG. 8, viz. of the inside of the door, but showing the bottom section of the door when the same is also in "stored" position;

FIG. 10 is a view similar to FIG. 9 but showing the lower section of the door in the closed or locked position; and

FIG. 11 is a fragmentary sectional view of the fittings associated with the bottom section of the door as seen in FIG. 10.

In the illustration given and with reference to FIG. 1, the numeral 10 designates generally a hangar or like structure which embodies the teachings of this invention. The hangar is seen to be equipped with an openable front door 11 housing an airplane 12. The hangar may be T-shaped generally along the lines of the configuration shown in my above-mentioned application. This can be appreciated from a consideration of FIG. 2 which is a perspective view taken from a rear corner and which shows the "cross" of the T as at 13 and the base of the T as at 14.

Generally, the hangar 10 consists of tubular members, optimally 3" O.D. aluminum alloy pipe No. 6063-T6, having a wall thickness of 0.065", which are integrated by castings or fittings of the character seen in FIGS. 2 and 4. The castings of FIGS. 3 and 4 are of particular importance in providing rigidity in the structure in the upper portions thereof, i.e., the generally A-shaped trusses.

The fitting in FIG. 3 is generally designated 15 and is seen to include a unitary body optimally constructed of No. 356 aluminum alloy and is further seen to include a plurality of sockets or receptacles for the receipt of the tubular framing members 16, 17, 18 and 19. For example, the socket portion 20 receives a horizontal top-wall framing member 19 while the socket 21 receives a vertical wall-framing member 18. The truss is defined by the tubular members 16 and 17 and sockets as at 22 and 23. It will also be seen that the cast fitting 15 includes integral lugs or flanges as at 24 for anchoring strut-like tie rods and/or wires 24a which connect opposite corners of the wall frames. Additionally, lugs or flanges as at 25 are provided integral on the fitting 15 for the mounting of other angle-reinforcing members and for the track (on the front corner castings) for the slidable mounting of the door 11.

In FIG. 4, the upper fitting is generally designated 26 and is used to define the ridge of the truss generally designated 27. As in the case of the fitting 15, four sockets or receptacle-providing portions are seen. The casting includes a downwardly-angled socket as at 28 for the receipt of the tubular member 29 and a like socket 30 is provided for the receipt of the tubular member 31. A downwardly-facing socket 32 is provided for the receipt of the tubular member 33 and a through socket 34 is provided

for the receipt of the ridge pole-providing tube (not shown).

In the case of the connections to the ridge fitting 26 and the truss corner fitting 15, I find it advantageous to provide an insert rigidifying element as at 35. It will be seen that the insert 35 projects inwardly of the associated tubular member 36 a distance further than the tubular member is ensleeved in the socket-providing portion 37. Thus, I provide an advantageous reinforcement for the transmission of stresses from the tubular member in question to the connective fitting and therefore the remainder of the structure. For this purpose, I pin or rivet the insert 35 to the tubular member 36 as at 38 and provide all three of the elements 35, 36 and 37 with aligned openings for the receipt of a cast aluminum pin 39. Like pins are used as, for example, at 40a relative to the fitting 26 and a like insert is advantageously employed at that particular site.

For the purpose of anchoring the structure to the ground, I find it advantageous to use cast fittings such as those designated 40 in FIGS. 5 and 6. The fitting 40 is equipped with a through socket as at 41 for the receipt of a tubular member 42 (see FIG. 5). Additionally, there is provided a block-like portion as at 43 (see FIG. 5) which is internally rigidified by means of ribs or solid metal to provide a bore as at 44 for the receipt of an elongated threaded anchor bolt 45. The anchor bolt is anchored at least 5 feet below the ground level in an anchor 46 which may be a Line Material Industries' four-way, flute-type steel expanding anchor model No. DA1E4, having a rated holding power of 12,000 lbs.

In installing the anchoring means, the anchor hole is dug or bored to the nominal size of the unexpanded diameter of the anchor 46. The bottom surface of the hole is advantageously relatively flat for the support of the anchor with the anchor rod being used to lower the anchor in a position after the anchor and rod have been assembled. The anchor is thereafter expanded by repeated blows with an expanding tool and thereafter the hole is filled with crushed rock and concrete.

After the installation thus described has been completed, the bottom nut 47 and washer 48 are put in place and adjusted to provide a level basis for the mounting of the hangar 10. After the bottom tubing is mounted in a generally rectangular plan, if desired, the tie-down casting 40 is installed and secured by means of the upper nut 49 and associated washer 50.

Reference to FIG. 5 reveals that the bottom tubing includes in addition to the outline-providing tubular members 51 and 52, a box arrangement as at 53 to rigidify the front corners where special loading occurs by virtue of the openable doors.

It will be seen that the leveling of the building is simply accomplished by adjusting the bottom tie-down nuts to the proper height. This method makes it possible to erect the structure on very uneven surfaces of practically any consistency. If desired, surfacing such as blacktop can be added to the interior of the bottom plan at any time.

The doors 11 are of the same design as the structural hangar frame. Wheels 54 and 55 provided at the top and bottom of the doors are exposed to the inside of the hangar, thus accessible at all times. To maintain proper rail contact as at 56, the upper wheels 54 may be spring-loaded as at 57. Should a wheel 55 ever jump the track 58, it can be put back in place quickly and simply. When the doors 11 are in the closed position, special cast hooks 59 and 60 engage the hold-down brackets as at 61 (see FIG. 11), thus tying the door to the ground and the roof truss, safe-locking it automatically. Entrance is gained by opening a 5-foot, "swing-in" side door and rolling a half section into a self-storing position inside the sidewall and repeating the process on the other side.

The roofing and siding, including the doors, can be advantageously constructed of corrugated aluminum sheet having an optimum thickness of 0.024".

While in the foregoing specification a detailed description of an embodiment of the invention has been set down for the purpose of explanation, many variations of the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. A shelter adapted for quick erection for the housing of airplanes and the like, comprising a frame which is generally rectangular in plan and consisting of a plurality of tubular members generally end-connected to define side-wall supporting means and trusses adapted to support a roof, and a plurality of four-receptacle fittings to end-connect said tubular members where said members define a truss ridge and truss corners, each fitting being a unitary body having four projecting tubular portions defining member-receiving receptacles, one of said member-receiving receptacles of each fitting being disposed at generally right angles with respect to the other three member-receiving receptacles, aligned openings in each projecting tubular portion and its associated tubular member, and pin means extending through said aligned openings securing said portion and member together.

2. A shelter adapted for quick erection for the housing of airplanes and the like, comprising a frame which is generally rectangular in plan and consisting of a plurality of tubular members generally end-connected to define side-wall supporting means and trusses adapted to support a roof, and a plurality of four-receptacle fittings to end-connect said tubular members where said members define a truss ridge and truss corners, each fitting being a unitary body having projecting tubular portions defining member-receiving receptacles, aligned openings in each projecting tubular portion and its associated tubular member, pin means extending through said aligned openings securing said portion and member together, a plurality of said members being equipped with rigidifying tubular end inserts having a length so as to project inwardly of its associated member a distance greater than the said members are received in the associated tubular portion, and means fixing said insert in place within said member.

3. The structure of claim 1 in which said frame is equipped with a plurality of anchor fittings adapted to secure said frame to the ground, each fitting being equipped with at least one receptacle portion for the receipt of a tubular member and a rigidified block portion for the receipt of an anchor screw, a screw received in said block portion and extending at right angles to the tubular member received in said one receptacle portion, and projecting into a ground footing.

4. The structure of claim 1 in which said frame is equipped with slidable, segmental doors, wheel means at the top and bottom of said doors facing the interior of said shelter, and lock means associated with said doors for maintaining the same in closed position.

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