

Sept. 30, 1958

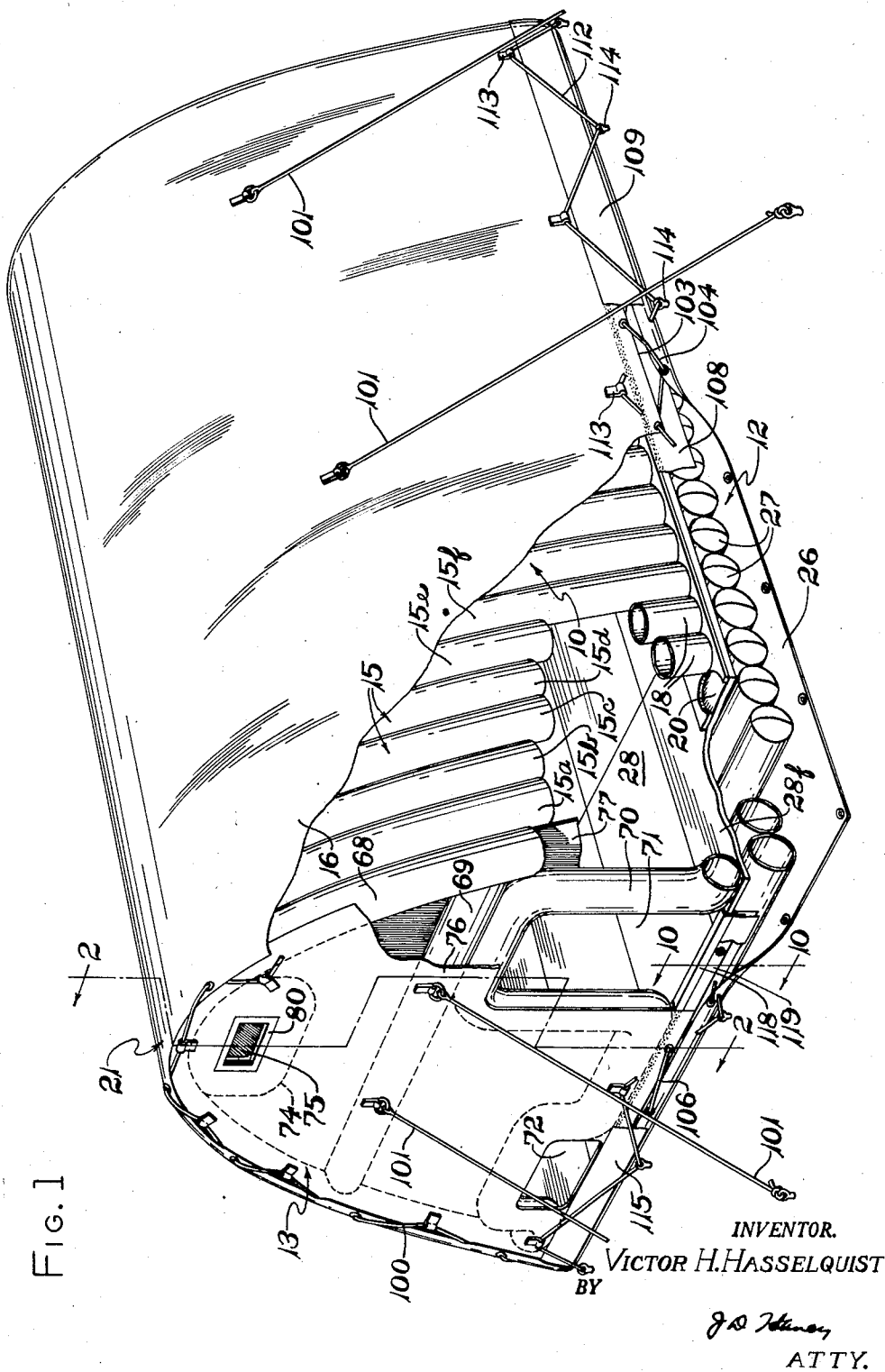
V. H. HASSELQUIST

2,854,014

INFLATABLE SHELTER

Filed Sept. 7, 1955

5 Sheets-Sheet 1



Sept. 30, 1958

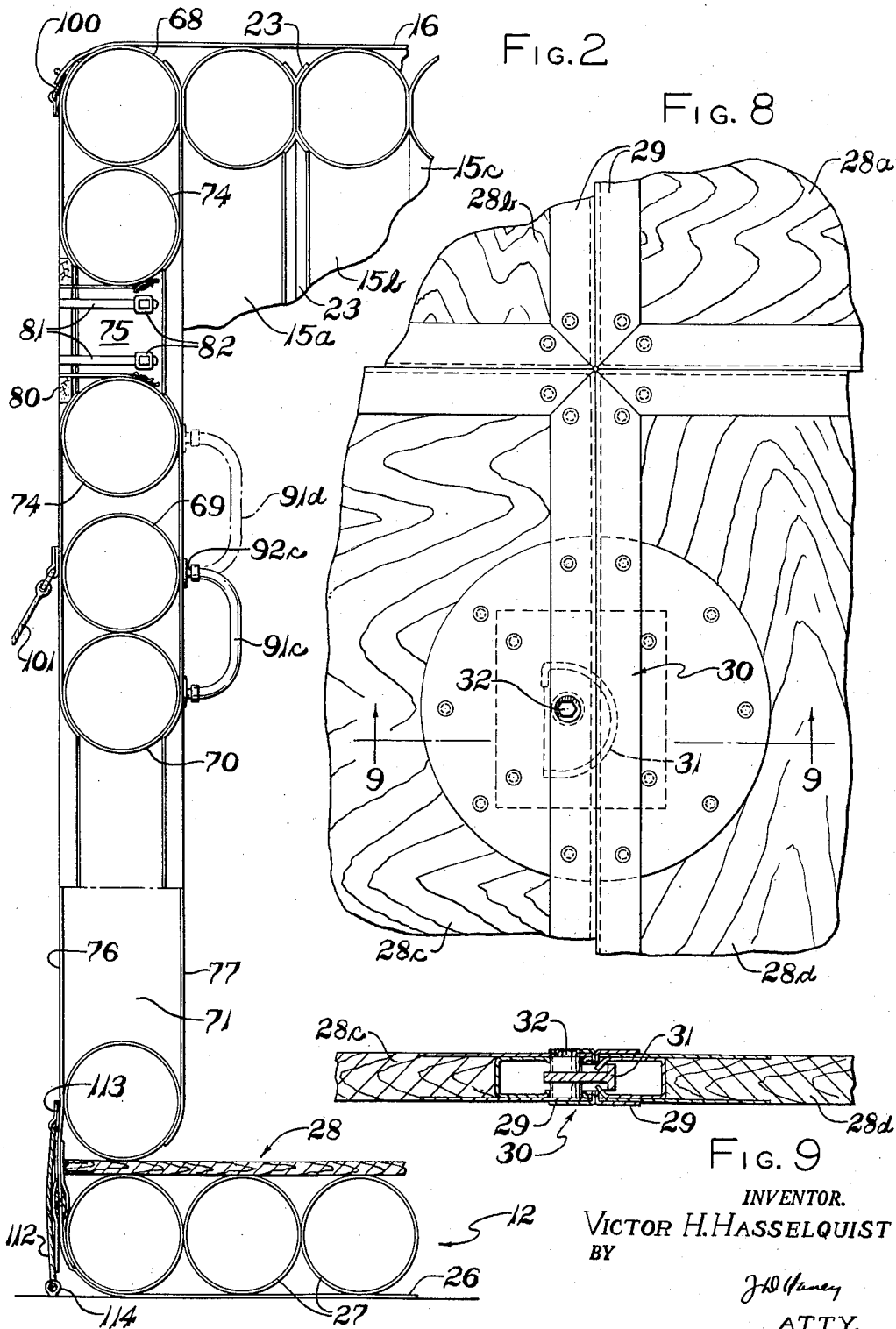
V. H. HASSELQUIST

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INFLATABLE SHELTER

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5 Sheets-Sheet 2



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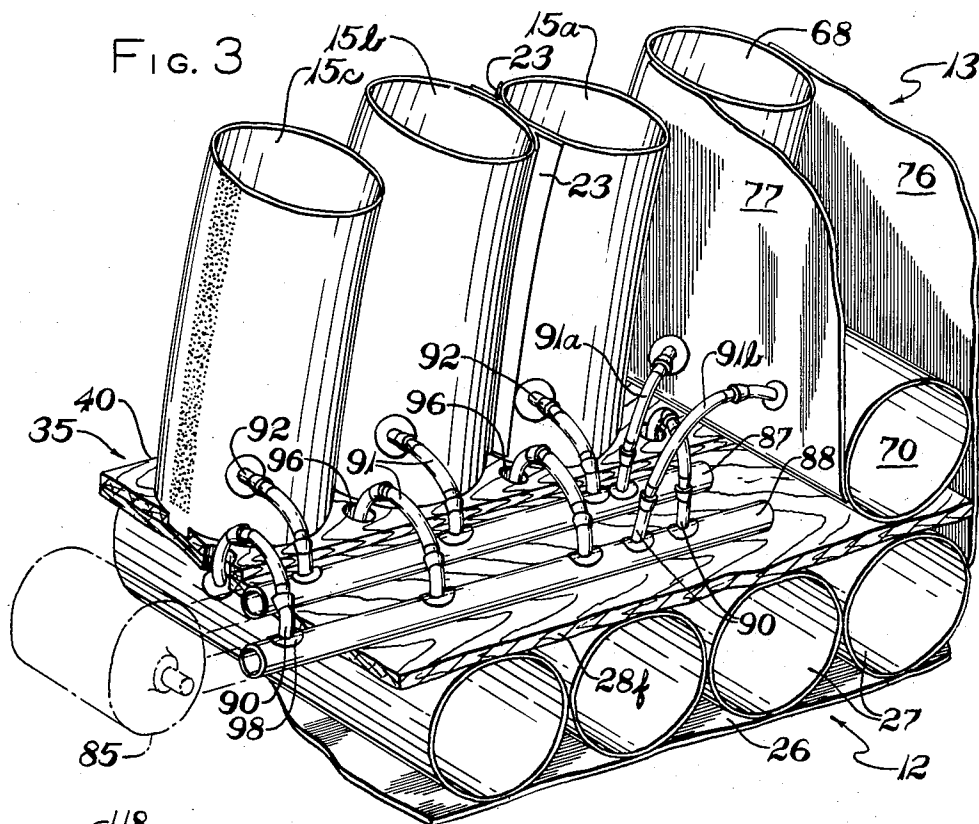
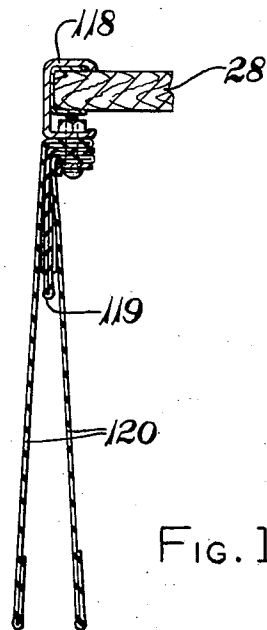
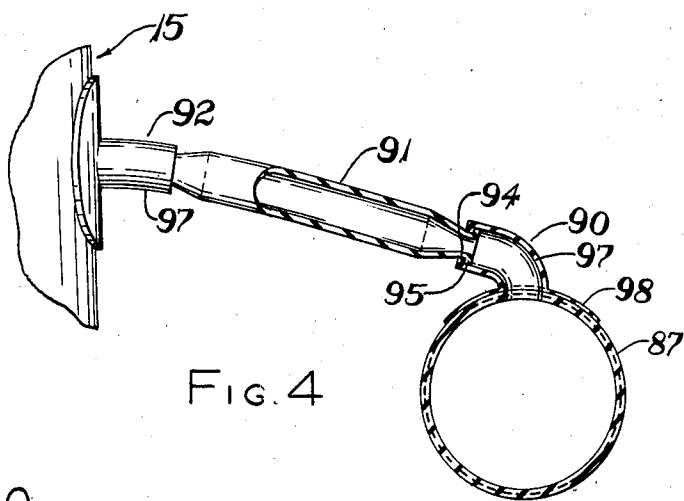
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INFLATABLE SHELTER

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5. Sheets-Sheet 3



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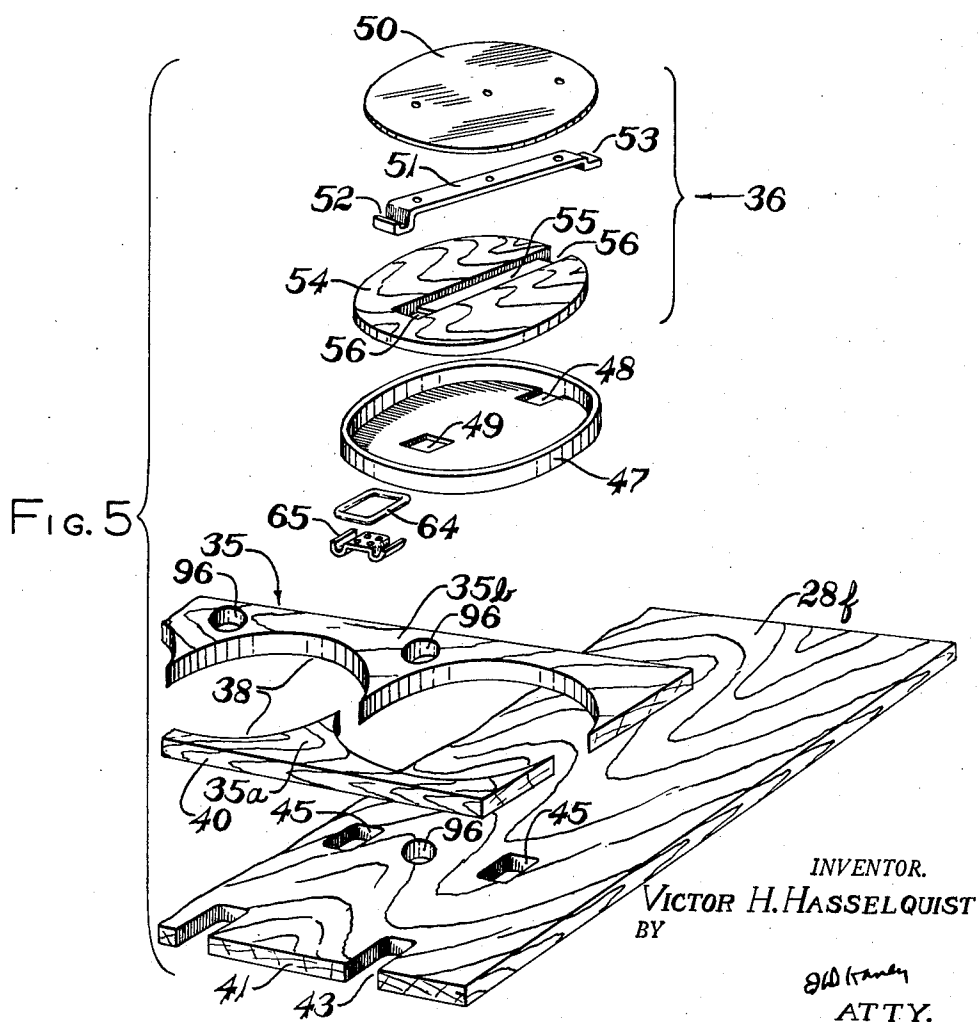
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V. H. HASSELQUIST
INFLATABLE SHELTER

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Sept. 30, 1958

V. H. HASSELQUIST

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INFLATABLE SHELTER

Filed Sept. 7, 1955

5 Sheets-Sheet 5

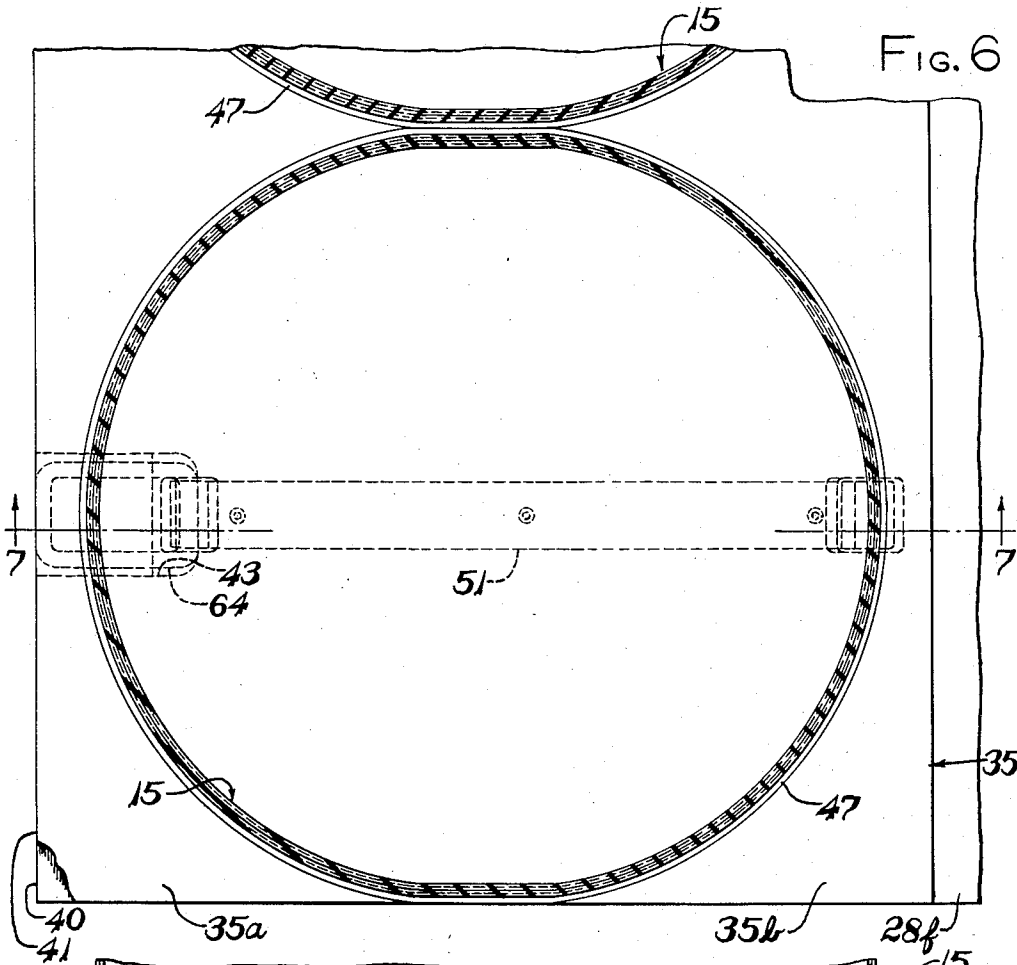
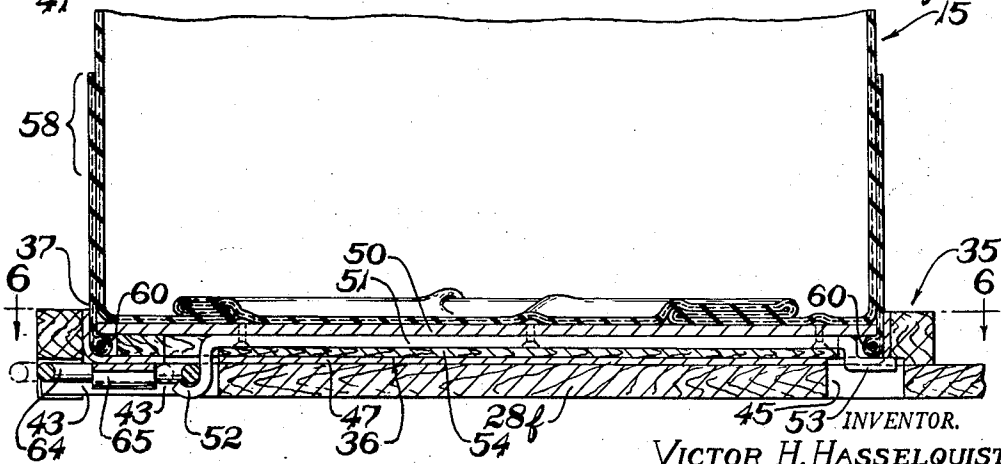


FIG. 7

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2,854,014

INFLATABLE SHELTER

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Application September 7, 1955, Serial No. 532,880

12 Claims. (Cl. 135—1)

This invention relates to inflatable structures especially useful for temporary or portable shelters.

The shelter of this invention is formed wholly of flexible, durable non-metallic rubber-treated materials, except for certain accessory parts, and is supported by inflation only. Its construction is such that it is especially suited for severe weather conditions in either Arctic or tropical regions and it may be formed of sufficient size to house a substantial field maintenance or repair shop, or to serve as a barracks for housing personnel comfortably under conditions of extreme heat or cold. It is highly portable and may be erected rapidly in the field by comparatively unskilled labor. Its various components, when disassembled, may be folded compactly and transported on a single truck or other vehicle.

The shelter of this invention in general includes a base or floor portion which is enclosed by a combined sidewall and roof structure comprising a series of arched inflatable tubes of circular cross section which are disposed transversely of the base portion, and which are arranged in successive tangential abutting relation to each other. These tubes are preferably formed wholly of rubber-treated fabrics and each is gradually but continuously curved throughout its length so that it extends upwardly from one side of the base through an apex portion and then downwardly to the opposite side of the base. When inflated these tubes are maintained in lateral pressure contact with each other and mutually cooperate to provide a weather-tight enclosure about the base. The tubes also serve as an effective heat-insulating barrier. The arched curvature of each roof tube is preferably parabolic in shape transversely to the shelter so that the roof is of sufficient strength to support substantial loads of snow and to resist severe wind loads.

The ends of the tubes adjacent the base are embraced by socket-like anchor members which are disposed transversely of their respective tubes and which are releasably engaged with their respective tubes to anchor the ends. The anchor members are particularly designed to resist the force of the inflation medium within the tube tending to displace the tube axially from the socket. The socket structure is quickly and conveniently assembled with the ends of the tubes during the erection of the shelter and the rigid or stiff portions of the anchor members are advantageously formed separate from the tubes so that they do not interfere with the collapsing of the tubes. Additional salient features of the shelter include inflatable, collapsible end walls which support such accessories for the structure as doors, ventilating fans and the like. Additionally, the base portion preferably includes a series of inflatable members which insulate the interior floor of the shelter from direct contact with the ground. The inflatable base members also enhance the buoyancy of the shelter and render it suitable to some extent for use in water or swampy areas and for movement in erected condition by floating it on water.

The invention will be further described with reference to the accompanying drawing, which illustrates a pre-

2

ferred shelter made in accordance with and embodying this invention.

In the drawings:

Fig. 1 is a perspective view with portions broken away;

Fig. 2 is a cross-sectional elevational view through one end wall of the shelter taken substantially along the line indicated by 2—2 in Fig. 1;

Fig. 3 is a detail view in perspective illustrating a junction of the arched roof tubes with the base portion and preferred inflation equipment assembled therewith;

Fig. 4 is a cross-sectional view through one of the inflation conduits;

Fig. 5 is an exploded view showing various parts of the anchoring sockets which secure the roof tubes to the base structure;

Fig. 6 is a cross-sectional view through one of the roof tubes along the line 6—6 of Fig. 7 showing the structure of Fig. 5 in the assembled condition in plan aspect;

Fig. 7 is a cross-sectional view taken along the line of 7—7 of Fig. 6;

Fig. 8 is a fragmentary view of a junction of several floor panels of the base portion;

Fig. 9 is a cross-sectional fragmentary view taken along the line 9—9 of Fig. 8;

Fig. 10 is a cross-sectional view taken along the line 10—10 of Fig. 1.

The major components of the shelter illustrated in the drawings include a combined roof and sidewall portion 10, a base portion 12 to which the roof 10 is secured; and inflatable end walls 13 at the opposite ends of the shelter which, together with the roof portion, provide an enclosure over the base.

The roof portion 10 is formed of a series of arched roof tubes 15, all of which are covered collectively by a flexible fabric roof cover sheet 16, which extends the length of the shelter from one end wall to the other. Each of the arched roof tubes is of circular cross-sectional shape and is preferably of uniform diameter throughout its length. Further, each tube 15 is continuously curved throughout its length and is disposed transversely to the base with its ends 18 secured to the lateral margins of the base portion in anchor sockets 20. The series of roof tubes are arranged in tangential abutting relation and in lateral pressure contact one to the other throughout the length of the shelter. A shelter may be constructed utilizing any number of tubes depending on the length of the shelter desired. As hereinafter explained, the roof tubes are independently inflated, and each is an integral, air-tight vessel. The curvature of each tube transversely of the shelter from one end 18 through an apex region 21 to the opposite end 18 of the tube is preferably substantially parabolic so that the tube has great resistance to static loads such as snow drifting upon the roof, and also offers adequate wind resistance. For example, a shelter constructed in accordance with the structure illustrated employing roof tubes of about 18 inches diameter, of parabolic curvature, and having a height to the apex above the ground of about 18 feet and a base width of about 32 feet has been tested to withstand 160 miles per hour winds and snow loads of as much as 40 lbs. per square foot. The construction is therefore ideally suited for Arctic climates for such purposes as weather stations or housing military equipment and the like.

Inflation of the arched tubes 15 provides the sole means for maintaining the tubes in erected condition and no internal structural supports or joists are necessary which would limit the head room available throughout the interior of the shelter. Preferably the roof tubes are integrally connected to each other in sets of two through-

out the length of the shelter so that if one of the roof tubes of a particular set is punctured or otherwise becomes deflated its companion tube in that set will support the deflated tube. Referring to Figs. 1 and 2 roof tube 15a is fastened integrally in tangential abutting relation to tube 15b by crotch tapes 23 and, similarly, tube 15c is fastened to tube 15d, tube 15e to tube 15f, etc. There is no interconnection, however, between tubes 15b and 15c, or between 15d and 15e, etc.; these latter tubes merely tangentially touch each other. The crotch tapes 23 (see also Fig. 3) extend the complete length of the tubes of each set in the crevices between the tubes along the exterior side of the shelter and in the crevices between the tubes along the interior side of the shelter. The stippled area along tube 15c in Fig. 3 indicates the approximate surface area which is abutted or engaged by the next adjacent tube.

The roof cover sheet 16 overlies the arched roof tubes from end to end of the shelter and, as hereinafter explained, the roof cover sheet is laid over the arched roof tubes before the tubes are fully inflated so that upon full inflation of the tubes, the cover 16 is stretched tautly and provides a smooth, continuous external surface for the shelter which is particularly adapted to shed rain and the like. The tubes are arranged relative to the cover so that upon full inflation of the tubes, the tubes are pressed against each other and thereby flattened along the regions of contact with adjacent tubes as best shown in Figs. 2 and 6. The term "tangential abutting relation" of the tubes as used herein includes lateral pressure engagement of adjoining tubes along a substantial surface area of the tubes.

The base portion 12 includes a flexible fabric ground cover sheet 26 which underlies the complete shelter structure and which directly underlies a series of straight base tubes 27 extending transversely to the shelter. The base tubes are independent of each other and are arranged so that upon inflation, these tubes are in successive tangential abutting relation one to another. Each of the base tubes may be rolled up individually when the shelter is in a knocked down or deflated condition to a very compact bundle. The base tubes are all of substantially equal length and terminate adjacent the side margins of the base of the shelter below the ends of the arched roof tubes.

The base portion 12 further includes a stiff floor area formed of a series of floor panels 28 which may be assembled together edge-to-edge upon the base tubes 27 and which are supported directly by the base tubes. Each of the floor panels is rectangular and is preferably formed of a light-weight plywood with steel channels 29 (Figs. 8, 9) embracing the edges of each panel on all four sides to reinforce the edges. Fig. 8 shows a typical junction of the corners of four floor panels, 28a, 28b, 28c, and 28d and further shows a preferred lock 30 for connecting the adjoining edges of panel 28c with panel 28d. A similar lock mechanism is embedded in each edge of the several panels, the portion of the lock mechanism containing a locking bolt 31 being in the edge of one panel and the mating portion of the mechanism with which the bolt engages being in an adjoining panel in a position to register with the locking bolt 31. The bolt 31 may be projected from the edge of its respective panel into interlocking engagement with its mating member in assembling the panels by rotating a stud 32 by a suitable key or wrench (not shown). A lock mechanism of the type illustrated is presently manufactured by the Simmons Fastener Corporation and is known as a "Roto Lock." Various other lock mechanisms may be used.

The extremities or ends 18 of each of the arched roof tubes 15 terminate at the floor panels 28f forming the lateral margins of the floor of the shelter and are secured to these floor panels by anchor members 20, the details of which are best shown in Figs. 5, 6 and 7. Each anchor

member includes three principal parts, viz., a circular socket 35 which is secured rigidly to the outer lateral margin of each floor panel 28f, a locking plate 36 which interlocks with the socket member 35 and with an end of each roof tube 15, and a flexible skirt 37 (see Fig. 7) formed integrally with each end of each of the roof tubes 15 to receive the plate assembly 36. In making the assembly of Fig. 7, the locking plate 36 is first engaged with the skirt 37, and then these members are inserted into and secured to their socket 35 on the panels 28f.

The sockets 35 are formed by a pair of mating wooden pieces 35a and 35b (Fig. 5) which extend the length of each marginal panel 28f and which include a series of substantially semi-circular cutout areas 38. The members 35a and 35b are preferably cemented or are otherwise secured to their respective panels 28f so that the outer edge 40 of the anchor member 35a is flush with the outer edge 41 of the panel and so that opposing cutouts 38 of the socket members register with each other to define a group of substantially circular sockets to receive the ends 18 of the roof tubes. The marginal panels 28f as best indicated in Fig. 5 include a plurality of slots 43 extending inwardly from edge 41 under member 35a, each slot terminating within the area of the panel defined by the registering cutouts 38. The panels 28f further include a series of square openings 45 each within an area defined by the registering cutouts 38 and located relative to its respective area substantially diametrically opposite the slot 43. The sockets 35 provided by the registering cutouts 38 are each lined by a snugly fitting dish-shaped metal plate 47 (see Figs. 5 and 7) which is formed with a pair of generally diametrically-aligned openings 48 and 49 registering respectively with opening 45 and the exposed portion of slot 43 of its respective socket. Each dish 47 is cemented to the socket members 35a and 35b and to the floor panel 28f.

The locking plate 36 for each tube end includes a circular metal disc 50 about equal in diameter to the diameter of the ends of the arched roof tubes. Riveted diametrically across this disc is a lock bar 51 having hook portions 52 and 53 at its opposite ends which are curved downwardly away from the disc. The disc 50 is reinforced by a wooden disc 54 preferably made of plywood and of slightly smaller diameter than the metal disc 50 and which has a central diametrical groove 55 with openings 56 at each end. The wooden disc 54 fits flat against the metal disc 50 and concentrically with respect to it with the groove 55 surrounding the lock bar 51 and with the hook portions 52 and 53 of the lock bar 51 projecting through the openings 56 in the wooden disc. Preferably the wooden disc 54 is cemented to the metal disc.

The flexible skirt 37 at the end 18 of each roof tube 15 is of tubular form and surrounds its respective tube end coaxially. It is preferably cemented and vulcanized to the tube end in the area 58 with the remaining portion of the skirt free of the tube. The uncemented skirt portion terminates in an annular bead 60 which is preferably a flexible cable of wire or twisted textile cord. The lower edge of the skirt is preferably folded about the cable and then secured to an upper portion of the skirt to surround the cable.

In anchoring a tube end in its respective socket, the portion (if any) of the tube end wall which projects beyond the bead 60 of the skirt is first tucked back inside the tube before the tube is inflated and then disc 50 of the lock plate assembly 36 is buttonholed through the bead and arranged transaxially of the tube so that the plate assembly 36 provides a metallic end wall for the tube. Since the periphery of the disc 50 is slightly greater than the circumference of the bead 60 of the skirt, the plate assembly 36 cannot be displaced axially from the skirt except by buttonholing the skirt over the edges of the disc. The locking plate 36 is assembled with

5

the skirt with the hooks 52 and 53 directed away from the tube end.

The tube end together with the locking plate 36 is then positioned in the dish 47 lining the interior of the particular socket to receive the tube end. It may be noted in Fig. 6 that the internal diameter of the dished plate 47 is slightly greater than the diameter of the disc 50 by about twice the thickness of the skirt so that the bead 60 can not be dislodged around the periphery of disc 50 after these parts are properly assembled within the dished plate 47. In positioning the tube end into plate 47, the hooked end 53 of the locking bar 51 is first inserted through the rearward opening 48 in the dish 47 and locked under the rim of the dish exposed by the opening 45 of the floor panel. Then the tube end is fully seated inside dish 47 so that the forward hook 52 of the locking bar 51 projects through the forward opening 49 of the dish and extends into the slot 43 in floor panel 28f. Thereafter the tube end is locked within its respective socket by a rectangular shackle 64 (see also Fig. 5) which is slidably mounted by a bracket 65 to the lower side of dished plate 57 within the slot 43 in the floor panel. The shackle 64 is slidable into engagement with the portion of hook 52 which projects below the bottom of dish 47 into slot 43. Access to the shackle is had through the mouth of the slot 43 at edge 41 of the floor panel 28f. The solid lines in Fig. 7 indicate the engaged condition of the slidable shackle 64 and the chain-dotted lines shown in the disengaged position.

After a tube end is locked within its respective socket, the tube is then inflated and it will be noted from Fig. 7 that the force of the inflating medium against the locking plate 36 is transmitted through the skirt directly to the walls of the tube. After inflation it is impossible to dislodge the tube end from the socket unless the shackle 64 is released.

A particular advantage of the foregoing assembly is that it is not only an effective means of anchoring a tube end to the floor panel transaxial of it, but it also avoids the necessity for making all of the roof tubes to accurate overall lengths. That is to say, the ends of the roof tubes 15 may be roughly finished in a square condition or may be gathered together with extra scraps of material in any manner desired so that the overall length of the roof tubes may vary from one tube to the other. The skirts 37, however, are accurately located on each tube so that the distance from the bead 60 of the skirt 37 at one end of the tube to the bead 60 of the skirt at the other end of the tube is uniform for all tubes in the shelter. Hence in erecting the shelter, any portion of a tube end that extends beyond the bead 60 of the skirt may be tucked or folded back into the tube and serves no function other than to maintain a non-leaking end wall for the tube. Fig. 7 shows some excess material of the end wall of the tube folded within the tube after the tube has been inflated.

Each end wall 13 of the shelter is formed with an arched tube 68 (Figs. 1 and 2) of equal length and of similar shape to the arched roof tubes 15 and includes a horizontal joist tube 69 the ends of which are fastened to the arched tube 68 approximately intermediate the floor of the shelter and the apex region 21. Additionally, each end wall includes a door framing tube 70 which extends from the end of the arched tube 68 at one side of the shelter upwardly in a rectangular path to define a door opening 71 and then along the bottom of the end wall, and then upwardly in a generally smaller rectangular path to define a vent opening 72 near the opposite side of the shelter. Near the apex region, of each end wall, a generally rectangular tube 74 is provided to define a window opening 75. There is preferably no direct communication between any of these tubes of the end wall, each of these tubes being preferably an independent air-tight vessel. The ends of the joist tube 69 and the door framing tube 70 are preferably folded inwardly and then ce-

6

mented to the exterior surface of the arch tube 68. If desired the ends of tubes 69 and 70 may be additionally secured to arch tube 68 by crotch tapes (not shown) and/or gusset fabric overlying the exterior surfaces of these tubes at the junctions of the tubes. The various tubes of the end wall are enclosed or enveloped by an outside sheet of fabric 76 (see Fig. 2) and an inside sheet of fabric 77 which are cemented tangentially to the several tubes. The window framing tube 74 is supported from the arch tube 68 by the outside and inside fabric sheets 76 and 77, respectively. The sheets 76 and 77 are cut away over the window area 75 and over the doorway 71. The ends of the arch tube 68 of each end wall are formed with skirts similar to that shown in Fig. 7 and are engaged with sockets in the floor panels 28f in exactly the same manner as the structure described for anchoring the roof tubes. In assembling the end walls 13 with the roof tubes 15, the arch tubes 68 of the end walls tangentially abut the adjacent arched roof tubes 15 in the manner shown in Figs. 1 and 2.

To support a ventilating fan (not shown) or the like within window opening 75, the opening is provided with a reinforcing frame 80 of rectangular shape and preferably of wood. The frame is slightly larger than opening 75 and may be engaged with the outside portions of tube 74 by a plurality of straps 81 which are buckled to appropriate buckles 82 fastened to tube 74. A fan or the like may be secured to the rigid frame 80 in the conventional manner. Similarly, although not specifically illustrated, a suitable rigid door frame (not shown) to receive wooden door (not shown) or the like may be mounted in the doorway passage 71 and suitable ventilation equipment or ducts (not shown) to conduct electric cables, water pipes, or the like into the shelter may be similarly mounted in the vent passage 72.

The various tubes of the shelter are preferably inflated by a suitably driven portable air pump 85 schematically indicated in chain-dotted lines in Fig. 3. The pump supplies a high pressure manifold 87 and a low pressure manifold 88 which extend interiorly through the shelter adjacent the ends of the arch roof tubes 15. The high pressure manifold maintains pressure in arched roof tubes 15 and the low pressure manifold supplies the base tubes and the end wall tubes. Each of these manifolds has a series of nozzles 90 each connected by a conduit 91 to a similar nozzle 92 on each tube 15.

Details of one type nozzle and conduit 91 suitable for this purpose are shown in longitudinal cross section in Fig. 4. The nozzles 90 and 92 are preferably of a flexible rubber tubular member of substantial size so that inflation may be effected rather rapidly. Each terminates in an inwardly turned lip 94 to engage an annular bead 95 at the ends of conduit 91. The conduit is also of flexible rubber material and is provided with tapered ends to permit the conduit to be squeezed into engagement with nozzle 90. The pressure of the flow of air through the conduit presses the ends of the conduit outwardly into sealing engagement with the nozzles. After each tube has been inflated sufficiently, its nozzle 92 may be tied closed with twine or the like or by a suitable clamp, and then the various hoses disconnected. Preferably, however, the manifolds remain connected with the tubes throughout the period during which the tubes are inflated. The pump 85 will preferably include appropriate pressure regulating valves (not shown) to maintain desired inflation pressure in the manifolds.

The conduits 91 through which the base tubes 27 are inflated extend from the low pressure manifold 88 through registering access holes 96 through the socket members 35b and their respective floor panels 28f (see also Fig. 5) and are connected to nozzles 92 provided on each of the base tubes. Preferably the base tubes are maintained connected with the low pressure manifold while the shelter is erected. As shown in Fig. 4, each nozzle 90 and 92 has a flexible neck 97 terminating in a flange 98 which is ce-

mented and vulcanized to the tube or to the manifold, as the case may be. The manifolds 87 and 88 are formed of flexible rubber-covered fabric.

An inflation pressure of about 2 pounds per square inch gauge is satisfactory inflation for the floor tubes 27 and therefore these tubes may be made of somewhat lighter materials than the arched roof tubes which preferably are inflated to a higher pressure. Although the roof tubes 15 will stand erect and in proper shape by pressures as low as 1/4 pounds per square inch (gauge), preferably about 5 pounds per square inch (gauge) is maintained in the roof tubes to maintain sufficient rigidity for the shelter. If desired, however, both the roof tubes and the floor tubes may be inflated to the same pressure from a single manifold. In the end walls, the arch tube 68 is preferably inflated to about 5 pounds per square inch (gauge) through a conduit 91a from high pressure manifold 87. The joist tube 69 and the door framing tube 70 are preferably inflated to about 2 pounds per square inch (gauge) and therefore the tube 70 is connected as shown in Fig. 3 by a conduit 91b with the low pressure manifold 88. While the door framing tube 70 is not in direct communication by way of its structure with the joist tube 69, these tubes may be interconnected for inflation purposes through a short conduit 91c (see Fig. 2) which is engaged with each of these tubes by a nozzle 92c similar to that shown in Fig. 4. Additionally, the upper window framing tube 74 may be interconnected for inflation with the joist tube 69 by another similar conduit 91d shown in chain-dotted lines in Fig. 2.

The pump mechanism 85 to supply the inflation air and its power source (not shown) will be located outside the shelter with the manifolds 87 and 88 leading into the interior of the shelter through the vent opening 72 in one of the end walls of the shelter.

Assembly

To assemble the shelter the ground cover 26 is first spread out on the area of ground upon which the shelter is to be erected. The ground cover will preferably have a series of markings (not shown) or suitable center lines painted on it to aid in locating the base tubes. The base tubes 27 with corresponding markings will then each be unrolled in register with the appropriate portion of the ground cover and will be positioned with their respective inflating nozzles 92 directed upwardly and all at the same side of the ground cover. Then the marginal floor panels 28f are assembled transversely over the base ends of the tubes with the nozzles 92 of the base tubes extending through the openings 96 in the floor panels. The low pressure manifold 88 is then laid along the floor panels 28f and connected with each of the base tube nozzles and then the floor tubes are inflated to the desired inflation pressure. Thereafter the additional floor panels are laid over these tubes and their respective locking mechanisms 30 (Fig. 8) are engaged to fasten the panels together.

Preferably the end walls 13 are then unfolded and positioned by engaging the ends of the arch tubes 68 of the end walls with their respective anchor sockets 20 in the floor panels 28f at each corner of the floor. Then the roof cover sheet 16 is laid over the floor and its end margins laced to the end walls 13 by a lacing 100 as shown in Fig. 1. It will be noted in Fig. 1 that the end margins of the roof cover overlap the end walls 13 and project over the curved margins of the outer fabric 76 of each end wall to receive the lacings. Prior to inflating the end walls, appropriate guys 101 are attached to the end walls and the roof cover. Preferably these guys and the lacings used are a high strength nylon cord or the equivalent. The roof cover is then raised by inflating the arch tubes 68 of the end walls and the additional end wall tubes are inflated by connecting them with the low pressure manifold. It is desirable during the initial stages of inflating the arch tubes 68 to maintain some tension

on the ends of these tubes manually to prevent the ends of these tubes from becoming dislocated from their respective sockets 20 until pressure is built-up inside the tubes.

After the end walls are fully inflated, the guys 101 are staked into the ground at suitable locations and then the pair of arched roof tubes 15 halfway intermediate the end walls are assembled in their respective sockets and inflated from the high pressure manifold against the roof cover. Then the remaining roof tubes 15 are inflated progressively on alternate sides of the central pair roof tubes until all of the roof tubes are fully inflated. Thereafter the various accessories such as the window fans, the doorways, etc., are assembled in their respective openings.

To complete the erection of the shelter, the lateral margins 103 of the roof cover are laced to the adjacent margins of the ground cover by a lacing 104 (Fig. 1) and, similarly, the lower edge of the outer cover 76 of the end walls are laced to the end margins of the ground cover sheet by a lacing 106 (Fig. 1). The lateral margins 103 of the roof cover are sandwiched between an interior downwardly hanging skirt 108 and an exterior skirt 109 and to insert the lacing 104, the side margins of the ground cover are folded upwardly between these two skirts. The outer skirt 109 provides a moisture for rain shield for lacing 104. It in turn is lashed flat against the sides of the base by an overlacing 112 through appropriate hooks 113 secured to the roof cover above the outer skirt and through eye stakes 114 driven into the ground immediately adjacent the sides of the shelter. The end margins of the ground cover are folded upwardly to receive lacing 106 under an outer skirt 115 which is overlaced by lacing 112 similarly to the lateral base margins of the shelter.

In the doorway area 71 the sill portion of the door is formed by a special C-shaped clamp 118 (Fig. 10) which embraces the end edges of floor panels and has depending therefrom a central fabric strip 119 which is lashed to the end margins of the ground cover intermediate a pair of strips 120 which overlie the lacing 106 along this region.

The various lacing through the ground covers extend through ordinary grommets secured in the fabric. The guys and the overlacings are connected to rings (not shown in detail) which are fastened to their respective cover elements by gusset patches preferably cemented or vulcanized directly to their respective portions.

The fabric used in the manufacture of the various tubes is preferably nylon fabric with a basket or square weave, straight laid, and stretched to equalize stress in all directions. Preferably the fabric from which the arched roof tubes are formed is somewhat thicker than the fabric used in the base tubes, or cover sheets. These fabrics are preferably calendered on both sides with a neoprene material, one layer of neoprene on each side being generally sufficient for each tube and provides adequate air retention properties for the tube. The sheets 76 and 77 forming the outside and inside of the end walls 13 are preferably neoprene coated also since it is sometimes desirable to inflate the regions of the end walls intermediate the main tubes to prevent these covers from flapping.

Variations of the structure disclosed may be made within the scope of the appended claims.

I claim:

1. An inflatable shelter comprising a ground cover sheet having lateral margins disposed lengthwise of the shelter, a plurality of inflatable base tubes upon said ground cover sheet, a plurality of stiff floor panels supported on said base tubes, means for interlocking adjacent floor panels edge to edge, a series of inflatable arched tubes arranged transversely to the base, each arched tube having ends connected to said floor panels adjacent said lateral margins of said ground cover sheet, and a roof cover sheet overlying all of said arch tubes

throughout the length of the shelter and having lateral margins fastened to said lateral margins of the ground cover sheet.

2. An inflatable shelter comprising a base, a series of flexible inflatable arched roof tubes arranged parallel and in laterally abutting relation to each other transversely to the base, each said tube being continuously curved throughout its length and terminating at said base with ends engaged with said base, and an end wall transverse to and upstanding from said base adjacent one of said arched roof tubes, said end wall including an arched tube coextensive in length and shape with said adjacent arched roof tube, a joist tube having opposite ends connected to said end wall arched tube away from the base, an end wall cover sheet tangentially enclosing said end wall arched tube and said joist tube and the area bounded by said end wall arched tube, and a roof cover sheet overlying said arched roof tubes and fastened to said end wall cover sheet.

3. In an inflatable shelter having a base extending lengthwise of the shelter and an inflatable roof structure of gradual continuous curvature arching transversely of the base from one lateral margin thereof to the opposite lateral margin, an end wall structure comprising an arched tube disposed transversely of the base and terminating at the lateral margins of the base in ends engaged with said margins of the base and being continuously curved throughout its length to the curvature of said roof structure, a straight joist tube having opposite ends connected with said arched tube above the base, a doorway framing tube extending transversely of the base interconnecting said ends of the arched tube and being directed away from the base intermediate said ends of the arch tube to define an access opening into said roof structure, and a cover sheet disposed tangentially of and secured to said arched tube, said joist tube and said door-framing tube.

4. An inflatable shelter comprising a base having lateral margins extending lengthwise of the shelter, a series of substantially circular sockets along each said lateral margin, the sockets being arranged in succession substantially tangential one to another, a series of inflatable flexible arched tubes of substantially circular cross section disposed transversely to the base in successive tangential abutting pressure engagement one to the other, each of the tubes terminating at said lateral margins in ends seated within a pair of opposing sockets, a flexible skirt embracing each said tube end the skirt including a bead portion coaxial of the tube, the skirt and said bead portion extending into the socket in which its respective end is received, and means in said socket engageable with said bead portion to secure said tube end to said socket.

5. In an inflatable shelter, an inflatable tube of flexible material, a flexible skirt about one end of said tube, the skirt including a bead portion, a bead-engaging member engaged with said bead portion, a rigid member transverse to the length of the tube, a socket formed in said rigid member having an opening therein in which said tube end and the portion of said skirt having said bead portion and said bead-engaging member are seated, and means for connecting said bead-engaging member within said socket to said rigid member.

6. In an inflatable shelter, an inflatable tube of flexible material having a substantially circular cross-sectional shape, a flexible skirt surrounding and secured to said tube at one end thereof, the skirt including an inwardly directed flexible bead disposed coaxially of the tube, a plate having an outer peripheral edge longer than the circumference of said bead, said plate being buttonholed through said bead and positioned interiorly of said skirt

transversely to the axis of the tube, and a rigid base member transverse to said tube axis having a circular socket therein in which said tube end including said skirt and said plate is seated, and means in said socket engageable with said plate to anchor said bead within said socket to resist axial displacement of the tube from said socket.

7. An inflatable shelter including a base and a roof structure above said base comprising a series of inflatable, flexible arched tubes arranged parallel to each other and in successive tangential abutting engagement one to the other throughout the length of the tubes, each tube having ends terminating at the base and being continuously curved throughout its length from one said end to the opposite said end, a flexible bead portion coaxial and integral with each said tube adjacent the ends thereof, and means engaged with said bead portion and said base for fastening the ends of each tube to said base.

8. A shelter in accordance with claim 7 which further comprises a flexible cover overlying said tubes and stretched tautly by said tubes.

9. A shelter in accordance with claim 7 in which each said tube is of generally parabolic curvature transverse to said base.

10. A shelter in accordance with claim 7 in which alternate tubes are integrally connected to only one of the next adjacent tubes.

11. In an inflatable shelter, a flexible fabric enclosure including at least one flexible tube inflatable to impart structural rigidity to said enclosure, said tube having a flexible fabric end closure integral with the tube wall, a flexible fabric skirt fastened to the tube axially thereabout adjacent said end closure, and a flexible continuous substantially inextensible bead disposed axially of the tube on said skirt, and means engaged with said bead for fastening said tube to an adjoining structural portion of said shelter to resist relative displacement of said tube and said adjoining portion in a direction axial of said tube.

12. A flexible fabric inflatable tube having an end closure portion and a generally cylindrical wall portion of material impermeable to the inflation medium, a flexible skirt fastened to the wall portion axially about the tube adjacent said end closure, a flexible continuous substantially inextensible bead in said skirt axially encircling the tube, and means embracing and interlocked with said bead for anchoring said end of the tube to an adjoining structural portion to resist relative displacement of the tube and said adjoining portion in a direction axially of said tube.

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