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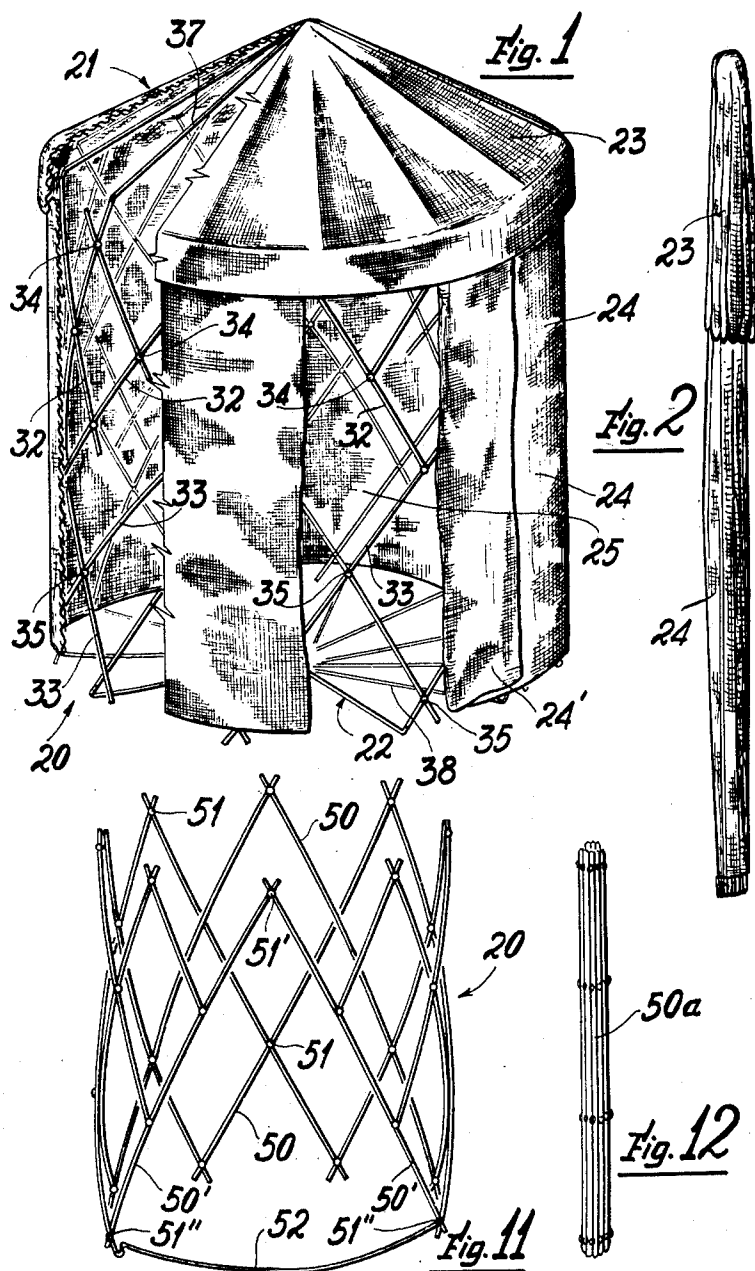
E. ANNIBALDI

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FOLDING STRUCTURE FOR FRAMING TENTS AND THE LIKE

Filed March 27, 1956

3 Sheets-Sheet 1



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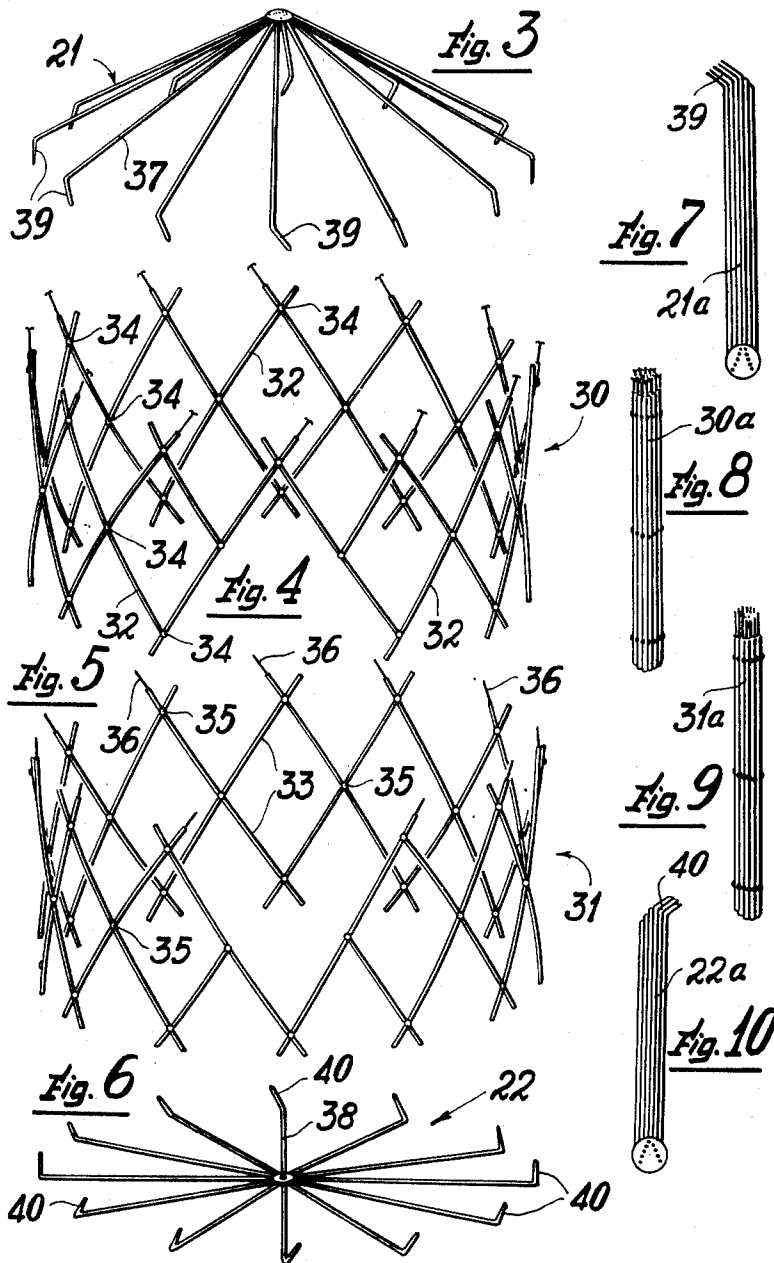
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3 Sheets-Sheet 2



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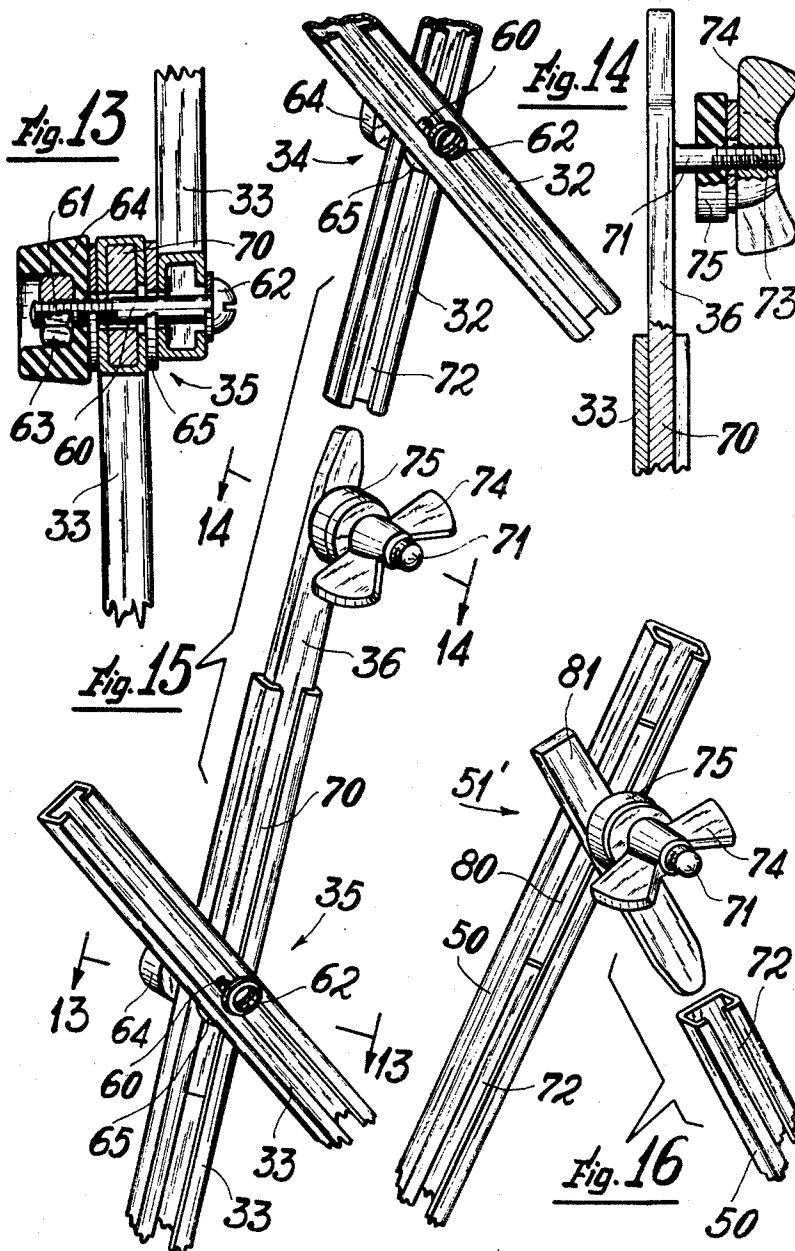
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FOLDING STRUCTURE FOR FRAMING TENTS AND THE LIKE

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5 Claims. (Cl. 135—4)

This invention relates to a new folding structure particularly intended for framing tents or like shelter means of transient character, say tents for military or civilian use, camping tents and shelters, dressing-tents or cabins to be made use of on sea-shore, beaches and the like, hunters' shelters and so on.

This invention more particularly has reference to a new and highly advantageous framing structure for folding and easily transportable shelter means for the uses referred to above, and it is embodied in a particular folding framework which actuates the whole or at least the principal and most essential component of the whole skeleton of the shelter resulting in a self-sustaining structure.

One of the primary objects of the present invention is to provide a novel framing structure embodied in a folding framework consisting in a plurality of rod-like frame members spacedly and evenly arranged in intersecting relationship and pivotally connected at any point wherein said frame members are intersecting each other, so that a plurality of diamond shaped spaces is formed between the said members, and a framework which may be folded by bringing the said pivotally inter-connected frame members close to one another is thereby produced.

Another object of this invention is to provide a foldable framework as above, wherein the said frame members are arranged and inter-connected to form a network which may be bent to actuate a substantially cylindrical structure, adapted to frame the shelter's side walls and therefore to construct a shelter means having substantially the shape of a cylinder, the said cylindrical framework being foldable substantially in the shape of a thick staff by bringing the said frame members close to one another and to the axis of said cylinder.

A further object of this invention is to provide, in a substantially cylindrical frame structure of the character referred to above, substantially pliable frame members adapted to be bent as to set on the curved surface of the said cylinder out-lined by the said network, wherein the said members are arranged along intersecting spiral or helical lines, thereby forming a curved frame structure well adapted to sustain the fabric or plastic side walls of the shelter in a cylindrical shape.

Still another object of this invention is to provide, in a substantially cylindrical framework as above, one or more portions of the network where the said frame members are cut away so as to form proper passages for entering and leaving the shelter.

Yet another object of this invention is to provide, in some forms of embodiment of the invention, particularly intended for framing tents or other shelters for which a rain and wind-proof roof or top is desired, the combination of a cylindrical foldable sidewall framework as above and of a substantially conical structure constituted by a plurality of radial members, pivotally connected at one of their ends to a center member for folding purposes and which may be detachably connected to the

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upper edge portion of said cylindrical structure at the other one of their ends.

Another object of this invention is to provide, in further forms of embodiment thereof, two or more substantially cylindrical and folding structures as described above, adapted to be unfolded to like diameters, to be superimposed one upon the other and detachably inter-connected in longitudinally continuous relationship to form together a continuous substantially cylindrical side wall framework, which may be disassembled and folded to constitute again a plurality of relatively short separate sections.

Other objects and advantages of the invention are in part obvious and in part will become apparent in this description.

The novel features which are considered characteristic of the instant invention are set forth in the appended claims. The invention itself, however, both as to its construction and as the method for making use thereof, will be best understood from the following detailed description of a few specific embodiments thereof as embodied in folding frameworks for actuating the skeleton of tents or shelters of the type referred to above, and when read in connection with the accompanying drawings, which constitute an essential part of this disclosure, and wherein:

Figure 1 is a perspective view of a tent of the type described and framed by a structure constructed according to one embodiment of the invention, the said structure being provided with fabric side-wall and top covering, shown partly removed for better understanding of the structural framing elements;

Figure 2 shows the tent of Fig. 1, in assembled and folded arrangement, to make apparent an advantageous characteristic of same, described below;

Figures 3, 4, 5 and 6 inclusive are perspective views of a plurality of structural folding components which in a preferred form of embodiment of the invention may be combined and interconnected for effecting the complete folding framework of the tent of Fig. 1;

Figures 7, 8, 9 and 10 inclusive are perspective views of the components of Figs. 3 to 6 inclusive, respectively, when in folded condition for transportation and/or storage;

Figure 11 is a perspective view of a folding framework constructed according to another form of embodiment of the instant invention, of simpler construction than the one of Figs. 3 to 10 inclusive;

Figure 12 is a perspective view of the framework of Fig. 11, when in folded condition for transportation and/or storage;

Figures 13 and 14 illustrate some structural details of the structure produced according to the various embodiments of the invention, said details being shown in a somewhat enlarged scale, in sectional view taken along the lines and in the directions of the arrows 13—13 and 14—14, respectively, of

Figure 15, which is a fragmentary perspective view of parts of the structural components of Figs. 4 and 5, adapted for inter-connection; and

Figure 16 is a fragmentary perspective view of another structural detail of an ancillary feature with which the framework constructed according to the invention might advantageously be provided for certain applications thereof.

In the several figures of the accompanying drawings, like or equivalent parts, members and elements are indicated by like reference numerals. Further, owing to the necessarily very reduced scale of the drawings, showing the whole structural assemblies or the whole structural components, the various elements thereof are illus-

trated in a somewhat simplified manner. Still further, owing to the substantial number of like elements comprised in each framework shown in Figs. 1 to 12 inclusive, only some of such elements are designated by numerals, for the sake of simplicity, it being obvious that any elements alike in appearance and arrangement are supposed to be designated by like numerals. In the two differing forms of embodiment of the invention, shown in Figs. 1 and 11, reference numeral 20 generally indicates the shelter's cylindrical side walls' framework as a unit.

Referring to the drawings:

As it will be readily apparent by a consideration of Fig. 1, a shelter of transient character, the tent illustrated in the drawing, for example, is framed and made self-sustaining by a framework 20 of substantially cylindrical shape, consisting of a network of substantially rod-like frame members arranged along spaced and intersecting helices defining the general shape of a cylinder, the axis of which is vertical. Said members are indicated by 32 and 33 in the upper and lower half portions, respectively, of said framework, where 34 and 35, respectively, indicate the points where said frame members intersect.

On said framework and adjacent to its outer face, a side wall covering 24 of fabric may be fastened, by means of strings, hooks, or suitable known devices, not shown, according to current knowledge of those skilled in the art to which this invention appertains.

In at least one substantial portion of the net-like cylindrical structure, the said frame members are interrupted or missing to form an opening or passage 25 for entering or leaving the tent. Said passage 25 may be cleared of the said covering 24 by partially folding back the same, as indicated at 24'.

Such a framework 20 is in itself sufficient for wholly framing a tent of the simplest shape, e. g. a dressing-shelter for beach use, which requires only a continuous canvas side wall. A disk-shaped canvas, adapted to be removably connected to said cylindrical framework at the upper edge thereof may however be provided, if desired.

In the improved form of embodiment of Fig. 1 the structure comprises a section 21, consisting of a plurality of first radial frame members 37, adapted to support a conical top or roof covering 23, and it further comprises a section 22, consisting in a plurality of second radial frame members 38, adapted to strengthen the said cylindrical wall structure 20 at the foot thereof.

The said radial frame members 37 and 38 of said structural sections 21 and 22, respectively, are adjacent and interconnected one to another at or near the axis of the cylindrical wall structure, and these same members may be detachably connected to the said cylindrical framework 20 at its upper and lower edge portions, respectively.

Assuming that said frame members 32 and 33 of the cylindrical frame structure 20 are interconnected by pivot means at points 34 and 35 respectively, and assuming that the skeleton of the tent also comprises the said sections 21 and 22, and further assuming that the radial members 37 and 38, respectively are provided at their ends with hinge means or with pliable portions, then said structural portions 21 and 22 may be folded like a conventional umbrella framing, the whole tent readily being collapsed in radial direction, thereby being brought to the shape and condition shown in Fig. 2.

Such radial folding of the tent may be attained even if the side and top coverings 24 and 23, are still attached to the framework. In the condition of Fig. 2, the tent may be easily carried or stored.

Such folding is made possible, according to the gist of this invention, by providing pivotal connections at the points of intersection of the elongated wall frame members, said connections making possible the folding of the structure by bringing the intersecting frame members to

a closed and substantially parallel relationship, from an open condition wherein the members intersect at substantially wider angles.

Of course, the canvas or coverings of the shelter may be detached from the framework, for ease of transportation or, storage and preservation of the equipment, for extended periods of time.

In Figs. 3 to 10 inclusive a particular form of embodiment of the folding structure of the tent of Figs. 1 and 2 is shown, wherein the skeleton of the complete tent consists of four separate component sections, namely of top framing 21 (Fig. 3), of side framings 30 and 31 (Figs. 4 and 5, respectively) forming in removably connected relationship the structure of the cylindrical framework 20, and of frame 22 (Fig. 5) designed to strengthen the foot portion of said cylindrical framework.

The said component sections 30 and 31 constitute two substantially alike cylindrical frameworks, each being of half the height of the cylindrical side wall framing structure, and consisting of a plurality of intersecting and pivotally connected frame members 32 and 33, respectively. At least some of said members, e. g., members 33 of section 31, are provided with extensions 36 adapted to engage at least some of the members of the other structural section, e. g., the lower end portions of members 32 of section 30.

Owing to such features, upon removal of the canvas or other covering material, the skeleton of the shelter may be easily disassembled into the said four component sections, all of which may be folded into relatively short bundles, as apparent in Figs. 7 to 10, wherein 21a, 30a, 31a and 22a indicate the structural sections 21, 30, 31, and 22 of Figs. 3 to 6, respectively, folded for easy transportation and storage.

In the modified and simplified form of embodiment of Fig. 11 the cylindrical structure 20 consists of a plurality of frame members 50 extending in the described intersecting helical relationship along the whole height of the shelter's side framing skeleton, pivotally interconnected at the various points 51. Such framework may be folded in a bundle 50a (Fig. 12), in a manner similar to the one described above.

The said frame members may be made of wood, preferably reinforced by metallic fittings, or of metal. Tubular and C-section members, either of aluminium and of rust-proof steel, have proved very successful. For example, said extensions 36 of members 33 (Fig. 5) may slidably fit into the lower end portions of the members 32 (Fig. 4) to detachably interconnect said sections 30 and 31.

In a similar manner, said radial members 37 and 38 of structural sections 21 and respectively 22 may be provided with extensions 39 and 40 respectively cross-sectionally dimensioned, arranged and inclined to slidably fit inside the upper and lower end portions of portions of members 32 and 33 of sections 30 and 31 respectively.

In the form of embodiment of the invention, shown in Fig. 11, where the entrance framed by the skeleton illustrated, is formed between two members 50 pivotally interconnected at 51' at one end portion of the cylindrical skeleton, the same members may be detachably interconnected by a cross member 52 detachably connected to at least one of points 51'' at the other end portion of said skeleton.

Provided that said member 52 is detachable from said members at least at one of said points 51'', and that the pivotal connection at 51' consists in a device adapted to complete separation of the members, if desired, the framework might be open in a not complete cylindrical shape. For example, it may be set up in semicircular shape for supporting and framing a sun-shading canvas. Also, a structure formed by the combined sections of Figs. 4 and 5 may be set up in an incomplete cylindrical shape as above, by making a few

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pivotal connections thereof detachable, e. g., the pivotal connections at the upper and lower portion respectively, in the forward side of sections 30 and 31 respectively, of the arrangement shown in the drawing.

Some structural details which may be advantageously but not exclusively made use of in realizing said several pivotal and/or detachable interconnections are illustrated in Figs. 13 to 16 inclusive. In said figures, said details are indicated as related to members 33 (Figs. 13, 14 and 15), to members 32 (Fig. 15), and to members 50 (Fig. 16), but it will be readily apparent to those skilled in the art that such details may be applied to the construction of other members, having equivalent requirements. For example, the construction of the pivotal connection 35 of Fig. 13 may also be applied to the construction of connections at the various points 34.

Referring now to said detailed drawings: the several pivotal connections of the structure of the invention may be constructed as shown in Fig. 15 and more particularly in Fig. 13. Such a connection consists in a pivot pin 60, having a screw-threaded end portion 61 and an enlarged head 62. Said pin traverses the members 33 at their interconnection at 35 and a nut 63 on said portion 61 co-operates with said head 62 for securing the connection. Said nut 63 is embedded in a hollow member 64 of rubbery material, adapted to prevent the canvas (not shown) adjacent to the formed framework from contacting said pin 60 and to oppose any undesired rotation of said nut. A washer 65 is preferably arranged about the said pin 60 between the members 33.

In Figs. 14 and 15 a detail of an interconnecting and securing device between sections 30 and 31 of the embodiment of Figs. 4 and 5, respectively, is shown. Said device is adapted to co-operate with frame members of C-section shape, as shown. It consists of an extension 36 having an elongated portion 70 firmly secured in the upper end portion of one member 33. Said pin 60 of the adjacent pivotal connection at 35 may traverse said portion 70 (see Fig. 13 too) for securing same in said member 33. Said extension is cross-sectionally shaped for slideably fitting inside the lower end portion of the member 32 when in longitudinally aligned relationship (Fig. 15). Said extension 36 bears a pin 71 protruding from a side thereof and adapted to freely pass through the longitudinal cut 72 of the C-section members 32 and it is provided with a screw-threaded portion 73 designed to co-operate with a wing-nut 74. Said wing-nut bears on a washer 75 of rubberlike material, adapted to frictionally engage the faces of member 32 adjacent to said cut 72, upon moderate tightening of said wing-nut, thus firmly securing the said extension 36 in the said lower end portion of frame member 32.

In carrying out the invention, in the form of the embodiment of Figs. 4 and 5, only few securing devices as above described are necessary for firm connection of section 30 to section 31, possibly no more than two or three securing devices, evenly positioned about the framework. Like or similar securing devices might be made use of for securing the said extensions 39 and/or 40 of sections 21 and/or 22, respectively, to the said sections 21 and/or 22, respectively.

Where a connection which is both pivotal and detachable is desired, e. g. at 51' (Fig. 11), a device as shown in Fig. 16 may be made use of. Such device consists in a pin 71 co-operating with a wing-nut 74 and with a rubber washer 75, similar to the elements of the device of Figs. 14 and 15, adapted to freely pass through the cut 72 of one member 50. Said pin is secured to and protruding from a bar member 80 secured or slideably fitted in another frame member 50 and it rotatably traverses another bar member 81 cross-sectionally shaped to slideably fit inside the first member 50. Said first member 50 may thus be connected to a second member 50 upon insertion of said bar member 81 in said second member 50. A moderate tightening of the wing-nut

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secures the connection of which the said pin 71 constitutes the pivot.

From the above, and by a consideration of the accompanying drawings it will be readily understood that I have invented a novel structure of the type described, which has great advantages over the known folding framing means for tents and similar shelter means. The new structure does not require central or corner poles for supporting the canvas, nor does it require rigging cords, stakes and the like. The interior of the shelter is free from poles, and its skeleton, while resilient at any points thereof, can resist strong winds and severe stresses, owing to the cylindrical shape of the shelter framed by my new structure and to the fact that said stresses are evenly distributed through a plurality of frame members which at their turn are evenly arranged about the side walls of the shelter. The framework of the invention may be mass-produced inexpensively, owing to the fact that it largely consists of standard members of small size and of simple manufacture.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of a tent frame structure differing from the types described above.

While the invention has been illustrated and described as embodied in a substantially cylindrical wall structure, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

I claim:

1. A tent frame structure comprising, in combination, a cylindrical lazy tong-type wall structure composed of two sets of substantially parallel extending rods intersecting each other and secured at said point of intersection to each other in lazy tong-like manner; a reinforcing structure at the bottom of said lazy tong-like wall structure composed of a plurality of rods secured together at one of their one ends to each other and detachably secured at their other ends to the rods forming said cylindrical lazy tong-like wall structure; and a conical roof structure composed of rods secured at one of their ends to each other and detachably secured at their other ends to the opposite end of said cylindrical lazy tong-like wall structure.

2. In combination, an expansible and collapsible substantially cylindrical lazy tong-type wall structure composed of elongated intersecting wall elements pivotally connected to each other at the respective points of intersection; and bracing means adapted to be connected to said structure when the same is in expanded condition for preventing collapse of said structure, said bracing means including a bracing structure having a central portion and a plurality of radially extending spokes adapted to be connected to the free ends of said elongated wall elements which are situated in a common plane.

3. In combination, an expansible and collapsible substantially cylindrical lazy tong-type wall structure composed of elongated intersecting wall elements pivotally connected to each other at the respective points of intersection so that when said cylindrical wall structure is in its expanded condition said elongated wall elements thereof assume a substantially helical configuration and their free ends form an angle with a transverse plane which is normal to the axis of said structure and which passes through the ends of said elongated wall elements; and bracing means adapted to be connected to said structure when the same is in expanded condition for preventing collapse of said structure, said bracing means including a bracing structure having a central portion and a plurality of radially extending spokes each of which has an inclined end portion forming said angle with a plane which is normal to the axis of said bracing structure and which passes through said end portions so that when

said bracing structure is superposed upon said cylindrical wall structure said end portions of said spokes are substantially co-directional with said ends of said elongated wall elements, said end portions of said spokes being adapted to be connected to the free ends of said elongated wall elements which are situated in a common plane.

4. The combination defined in claim 3 wherein said spokes of said bracing structure are pivotally mounted on said central portion thereof, so that said bracing structure when disconnected from said cylindrical wall structure may be folded into a position wherein said spokes are substantially parallel to each other.

5. In combination, an expansible and collapsible substantially cylindrical lazy tong-type wall structure composed of elongated intersecting wall elements pivotally connected to each other at the respective points of intersection; and bracing means adapted to be connected to

said structure when the same is in expanded condition for preventing collapse of said structure, said bracing means including a substantially frusto-conical bracing structure having a central portion and a plurality of radially extending spokes adapted to be connected to the free ends of said elongated wall elements which are situated in a common plane.

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