INFLATABLE STRUCTURE FOR COVERING SPORT UTILITY VEHICLES, BOATS AND THE LIKE

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ABSTRACT

A pneumatically inflatable structure includes first and second parallel spaced apart pneumatic end support tubes and at least two opposed pairs of bowed criss-crossed pneumatic bracing tubes and an arched canopy extending over the support tubes and bracing tubes. Each of the end support tubes has first and second opposed ends each mountable to a base surface wherein each of the end support tubes forms a vertical arch having an apex when the structure is erect. The pneumatic bracing tubes have first and second ends wherein each of the first ends of the bracing tubes are secured to one of the first or second ends of one of the first or second end support tubes. Each of the second ends of the pneumatic bracing tubes are securable the apex of an opposed of the first or second end support tubes.
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CROSS REFERENCE TO RELATED APPLICATION


FIELD OF THE INVENTION

[0002] This invention relates to the field of inflatable structures including tents and in particular to an inflatable structure useful as an event venue, portable temporary shelter, or for covering from the elements mid to large sized vehicles including vehicles, boats and the like.

BACKGROUND OF THE INVENTION

[0003] Inflatable tents for use in camping are known in the prior art and are sold commercially by for example Airzone Recreation Products of Kelowna, British Columbia, Canada. Such tents typically replicate camping tents available commercially which rely on bent fibreglass poles for their support structure and instead substitute inflatable poles which, when bent, provide the supporting framework for the exterior fabric skin or canopy of the tent over which a so-called fly sheet may be mounted. In the other extreme, large tents are known in the prior art for use such as by the military for providing field barracks, field hospitals and various depot facilities, such tents often being made of canvas and supported on tubular metal-pole supporting structures.

[0004] Applicant believes that a commercial need exists for relatively large pneumatically inflatable tent-like structures which are larger than conventional recreational camping tents and smaller than military-style field tents. It is believed that such structures will find commercial acceptance and use by the owners of large for example sport utility vehicles, boats, trailers, and other wheeled vehicles or towables which ordinarily would require a large garage or shed for their safe storage and which are often not housed in, for example, conventional residential homes as not having extended garage facilities. Also applicant believes that commercial acceptance and use of such larger pneumatically inflatable tent-like structures may include those in the field of portable corporate sponsorship pavilions for example for use in trade-shows, portable pneumatically inflatable recreational and professional sports shelters for sheltering equipment, non-engaged players, or sickly or wounded players on for example the side-lines of a sports field.

[0005] What is required, is a relatively larger pneumatically inflatable structure which may be readily transportable in that, when collapsed, the structure is not exceedingly heavy or overly bulky so the structure may be transported in for example the aforementioned sport utility vehicles, in minivans, or in the beds of pickup trucks and the like, and for example may be carried by two adult males to a convenient location for their use, and wherein the structure may be erected using for example a high volume, low pressure air compressor running for example from the twelve volt power source of the vehicle used to transport the collapsed structure.

[0006] In the prior art applicant is aware of the following issued patents illustrating aspects of the state of the art in pneumatically erectable structures including tents:


SUMMARY OF THE INVENTION

[0008] According to a first embodiment of the present invention there is provided a pneumatically inflatable structure comprising first and second parallel spaced apart pneumatic end support tubes and at least two opposed pairs of bowed criss-crossed pneumatic bracing tubes and an arched canopy extending over the support tubes and bracing tubes. Each of the end support tubes has first and second opposed ends each mountable to a base surface wherein each of the end support tubes forms a vertical arch having an apex when the structure is erect. The pneumatic bracing tubes have first and second ends wherein each of the first ends of the bracing tubes are secured to one of the first or second ends of one of the first or second support tubes. Each of the second ends of the pneumatic bracing tubes are secured to the apex of an opposed one of the first or second end support tubes.

[0009] The array of the pneumatically inflatable structure may comprise two end support tubes and the two opposed pairs of bracing tubes may be mounted thereto and extend therebetween. The array may further comprise at least one intermediate support tube forming a vertical arch between and in parallel to the end support tubes at a location where one of the at least one intermediate support tubes intersects a junction of the bracing tubes where the bracing tubes criss-cross. The support tubes and bracing tubes may have equal length. The support tubes and the bracing tubes may be substantially identical.

[0010] The canopy may be secured to the support tubes and the bracing tubes for example either over the top of the tubes, or under the tubes, that is the tubes thereby forming an exoskeleton, or as a webbing between the tubes. The pneumatically inflatable structure may further comprise securing means
such as various fasteners for securing the ends of the support tubes to the base surface. The securing means may comprise a flexible or hinged fastener, and may also include a ground spike. The base surface may merely be the ground surface or may include a planar sheet, strapping, etc.

[0011] The pneumatically inflatable structure may further comprise at least two opposed pairs of bowed criss-crossed pneumatic bracing tubes lengthwise connected to each other. The support tubes and bracing tubes may advantageously be pneumatically interconnected by a flexible air conduit extending therebetween so that the entire structure may be inflated simultaneously from a single source of pressurized air.

[0012] The support tubes and bracing tubes may comprise outer resilient tubes snugly mountable within outer non-resilient straight sleeves in snugly journaled relation therethrough. Each sleeve of the outer non-resilient straight sleeves may have a seam extending linearly along its length. Each seam may be an overlapped seam having an overlapped portion within the sleeve due to torsion of the sleeve following form of the sleeve wherein the overlapped portion is formed of the longitudinal edges of material forming the sleeve. The overlapped portion may be folded over so as to be disposed perpendicular to a curvature of the seam when the support tubes and bracing tubes become curved as they are inflated, being constrained at their ends where mounted to the base surface.

[0013] The support tubes and bracing tubes may be self-sealing by self-sealing means at ends of support tubes and the bracing tubes. The self-sealing means may comprise ends of the inner resilient tubes which are folded over onto themselves wherein the ends of the tubes are anchored by anchoring means to the ends of the first and second supports. The ends of the first and second supports may each be formed as a flap hinge when the ends are mounted to the tent canopy.

[0014] The inner resilient tubes may be adapted, when mounted in the sleeves, to contain air pressurized up to between 8 to 12 pounds per square inch.

[0015] The pneumatically inflatable structure may further comprise a canopy vestibule extending from an opening aperture into the pneumatically inflatable structure.

[0016] Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In drawings which illustrate embodiments of the invention wherein similar characters of reference denote corresponding parts in each view.

[0018] FIG. 1 is a perspective view of a pneumatically inflatable structure according to a first embodiment of the invention.

[0019] FIG. 2 is a perspective view of the pneumatically inflatable structure of FIG. 1 with the canopy removed.

[0020] FIG. 3a is a side elevation view of the pneumatically inflatable structure of FIG. 1.

[0021] FIG. 3b is a plan view of the pneumatically inflatable structure of FIG. 1.

[0022] FIG. 4 is a bottom plan view of the canopy of the inflatable structure of FIG. 1.

[0023] FIG. 5 is a perspective view of a pneumatically inflatable structure according to an alternative embodiment of the invention having an end vestibule.

[0024] FIG. 6 is a perspective view of a pneumatically inflatable structure according to an alternative embodiment having increased dimensions.

[0025] FIG. 7 is a detailed view of the flexible end flaps of the pneumatic tubes according to the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0026] Referring to FIGS. 1-4, a pneumatically inflatable structure according to a first embodiment of the invention is shown generally at 10. The pneumatically inflatable structure 10 includes two parallel spaced apart pneumatic end support tubes 12 and two opposed pairs 20 of bowed and criss-crossed pneumatic bracing tubes 22 covered by a canopy 30. In one embodiment of the invention, end support tubes 12 and bracing tubes 22 are substantially identical as better described below. The pneumatically inflatable structure 10 may also include a base surface such as base sheet 16.

[0027] The pneumatic end support tubes 12 include ends 12a secured to base sheet 16 or to the ground and are bowed when inflated so as to have an apex 18 be also downwardly concave. The pneumatic support tubes 12 are arranged in parallel to each other so as to define a common opening 8 thereunder sized for mid to large sized vehicles including vehicles, boats and the like. The pneumatically inflatable structure 10 may also include one or more intermediate support tube 13 secured to the base sheet or ground which are oriented and bowed in parallel to the end support tubes and so as to also have an apex 18. As illustrated in FIG. 2, one intermediate support tube 13 is utilized and located at the junctions 24 of the two pairs of the bracing tubes, although it will be appreciated that more than one intermediate support tube may also be utilized at different locations between the end support tubes 12. Advantageously tubes 12 and 13 form a substantially parallel spaced apart array of curved supports having substantially the same height and width dimensions for each of the curved supports.

[0028] Each pair 20 of pneumatic bracing tubes 22 are criss-crossed at corresponding junctions 24 in fluid communication with one another by a cooperating hollow flexible conduit 26. The first and second opposite ends 22a and 22b, respectively of tubes 22 are mounted to opposed pneumatic end support tubes 12, that is, to the end support tubes at each end of structure 10. The first ends 22a are each connected to a base 12a for example by the use of securing means such as flexible end flap 64 formed at the end of each of the tubes. The second ends 22b are each connected to apex 18 of the tube 12 at the opposite end of structure 10, for example by the use of flexible end flaps 64 formed at the end of each of the tubes, so that each tube 22 extends the length of, and generally diagonally across each lateral side of the structure 10. The bracing tubes 22 may be secured to each other as well as to the support tubes 12 and 13 by means of securing straps 80. Securing straps 80 may comprise of cable ties, string, ropes or any other suitable strap means.

[0029] Each of the pneumatic end support tubes 12 are bowed and arranged parallel to each other so as to form a frame having downwardly concave elongate structure defining a common opening 8. Intermediate support tube 18 are bowed and oriented in parallel to the end support tubes 12 so as to support a middle portion of the canopy 30. The pneu-
matic bracing tubes 22 extend between and brace the end support tubes 12 so as to maintain them in their desired parallel orientation. Thus taken in combination the two opposed pairs 20 of pneumatic bracing tubes 22 and the end support tubes 12 define an elongate open enclosure elongate along longitudinal axis A.

[0030] Referring to FIG. 4, canopy 30 comprises a rectangular substantially planar flexible sheet of material having first and second end edges 32 and 34, respectively and first and second side edges 36 and 38, respectively. The canopy includes a plurality of securing straps 40 attached to a bottom surface thereof. The securing straps 40 comprise an elongate strip of material having first and second fastenable portions 42 and 44, respectively. The first and second fastenable portions may be secured to each other after the securing strip encircles one or more of the end or intermediate support tubes 12 or 13 or the bracing tubes 22 and serve to secure the canopy 30 thereto. As illustrated in FIG. 1, the canopy 30 also include end flanges 46 extending inwardly from the canopy so as to surround the support tubes 12.

[0031] As illustrated in FIG. 1, the canopy 30 includes an exterior surface 31 which may include one or more guy loops 33 for securing a conventional pegged guy wire 35 thereto. It will be appreciated that the guy wires 35 will assist in the lateral stability of the inflated structure 10, in particular when subjected to side loads such as wind, for example.

[0032] In an alternative embodiment as illustrated in FIG. 5, the pneumatically inflatable structure 10 may include a vestibule 50 extending from one or more ends. The vestibule 50 comprises a sheet of material extending from the first or second edge 32 or 34 of the canopy 30 to a ground securing location 52 at a distance from the first or second end of the structure 10. The vestibule 50 provides increased wind resistance and security to the structure. The vestibule 50 may be formed as a common sheet with the canopy 30 or may be a separate sheet that is connected to the canopy when the structure is erected.

[0033] The inflatable structure 10 may include a base sheet 16 comprising a rectangular sheet of material to which the ends 12b and 12f of the end support tubes as well as the ends of the intermediate support tubes 13 and the bracing tubes 22 may be secured. The base sheet 16 may provide the dimensions of the base of the inflatable structure 10 when erected. Alternatively the inflatable structure 10 may be secured to the ground by passing a fastener 60, such as for example a ground spike through an eyelet 62 in the end flaps 64 of the end or intermediate support tubes 12 or 13 or the bracing tubes 22, as illustrated in FIG. 7.

[0034] In a further embodiment of the present invention, one or more of the inflatable structures 10 as taught above may be lengthwise connected to each other to form a common modular elongate structure. Where more than one inflatable structure 10 are employed modularly and each already has a base 16 mounted to the ends of the pairs of tubes, in a further embodiment of the present invention, a separate spanning, joining or linking section is employed to join the adjacent sides of the base 16. As may be understood then, it is not necessary that the inflatable structure according to the present invention merely and only is limited to two end support tubes 12 and a single span of bracing tubes 22 as it will be understood that a further elongated enclosure may be constructed using two or more pairs of criss-crossed bracing tubes similar to pairs 20.

[0035] In a preferred embodiment, each of the criss-crossed pneumatic bracing tubes 20 of tube pairs 22, pneumatic end support tubes 12 and pneumatic intermediate support tubes 13 are of a design such as taught in my U.S. Pat. No. 6,263,617 and incorporated herein by reference such that a resilient or at least flexible inner tube is mounted within an outer flexible relatively non-resilient sleeve, and wherein such a sleeve has a folded seam along its interior circumference folded over so that the sleeve and inner tube may be constructed as a linear pole which may then be bent to accommodate the required bowed shape to form the inflated structure. It has been found that such inflatable tubes for example having approximately a twenty inch circumference which is constant along the length of each tube may be inflated to approximately eight to twelve pounds per square inch (psi) and thereby provide sufficient rigidity for an inflatable structure which may then house wheeled vehicles or towable trailers such as a trailer and boat combination which is not intended to be limiting.

[0036] Thus in one embodiment, the width of the span between ends of the pneumatic end and intermediate support tubes 12 and 13 may be approximately ten feet and the distance between the opposite end support tubes is approximately twenty feet. Accordingly the height to the apex 18 of the pneumatic end and intermediate support tubes 12 and 13 will be approximately eight feet. The pneumatic end tubes and intermediate support tubes 12 and 13 respectively and pneumatic bracing tubes 22 will thus each be approximately twenty-four feet long. It will be appreciated that other lengths of the pneumatic end and intermediate support tubes 12 and 13 and pneumatic bracing tubes 22 may also be used for other desired dimensions of the inflatable structure.

[0037] In a second embodiment illustrated in FIG. 6, the pneumatic end and intermediate support tubes 12 and 13 and pneumatic bracing tubes 22 may be sized so as to provide a structure having internal dimensions adequate for covering the folded wings of a light aircraft. As illustrated in FIG. 6, the pneumatic end and intermediate support tubes 12 and 13 and pneumatic bracing tubes 22 may be approximately 47.3 feet long. Accordingly the structure illustrated in FIG. 6 may therefore be 46 feet long, 32 feet wide and having a height of approximately 16 feet.

[0038] An array of interconnected airlines 70 stemming from a common manifold 72 may be used to simultaneously inflate all of the tubes, where for example separate air lines 70 are mounted in fluid communication with adjacent ends of tubes 12, 13 and 22, and a single source (not shown) of pressurized air is mounted to manifold 40. Alternatively, separate air sources may also be used for pressurizing separate zones of the structure as defined by a grouping of fluidically interconnected tubes. Alternatively, the structure 10 may include a plurality of tubes 12, 13 and 22 mounted adjacent to and in parallel to each other such that one set of tubes 12, 13 and 22 defines a first circuit while a second set of tubes 12, 13 and 22 defines a second circuit. It will be appreciated that duplication of each tube of the structure permits that structure to remain erected should a leak occur in one of the two circuits.

[0039] As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.
What is claimed is:

1. A pneumatically inflatable structure comprising:
   first and second parallel spaced apart pneumatic end support tubes, each of said end support tubes having first and second opposed ends each mountable to a base surface wherein each of said end support tubes forms a vertical arch having an apex when said structure is erect;
   at least two opposed pairs of bowed criss-crossed pneumatic bracing tubes, each of said bracing tubes having first and second ends wherein each of said first ends of said bracing tubes are secured to one of said first or second ends of one of said first or second end support tubes, wherein each of said second ends are securable said apex of an opposed of said first or second end support tubes; and
   an arched canopy extending over said support tubes and bracing tubes.

2. The pneumatically inflatable structure of claim 1 comprising two end support tubes and two opposed pairs of bracing tubes mounted thereto and extending therebetween.

3. The pneumatically inflatable structure of claim 2 further comprising at least one intermediate support tube forming a vertical arch between and in parallel to said end support tubes at a location defined by a junction of said bracing tubes.

4. The pneumatically inflatable structure of claim 1 wherein said support tubes and said bracing tubes has equal length.

5. The pneumatically inflatable structure of claim 4 wherein said support tubes and said bracing tubes have are substantially identical.

6. The pneumatically inflatable structure of claim 1 wherein said canopy is secured to said support tubes and said bracing tubes.

7. The pneumatically inflatable structure of claim 1 further comprising securing means for securing said support tubes to said base surface.

8. The pneumatically inflatable structure of claim 7 wherein said securing means comprises a fastener.

9. The pneumatically inflatable structure of claim 8 wherein said securing means comprises a ground spike.

10. The pneumatically inflatable structure of claim 1 wherein said base surface comprises a ground surface.

11. The pneumatically inflatable structure of claim 1 wherein said base surface comprises a planar sheet.

14. The pneumatically inflatable structure of claim 1 further comprising at least two of said opposed pairs of bowed criss-crossed pneumatic bracing tubes lengthwise connected to each other.

15. The pneumatically inflatable structure of claim 1 wherein said support tubes and said bracing tubes are pneumatically interconnected by a flexible air conduit extending therebetween.

16. The pneumatically inflatable structure of claim 15 wherein said support tubes and said bracing tubes comprise inner resilient tubes snugly mountable within outer non-resilient straight sleeves in journaled relation therethrough.

17. The pneumatically inflatable structure of claim 16 wherein each sleeve of said outer non-resilient straight sleeves has a seam extending linearly along its length, each said seam being an overlapped seam having an overlapped portion within said sleeve due to inversion of said sleeve following forming of said seam, said overlapped portion formed of the longitudinal edges of material forming said sleeve, said overlapped portion folded over so as to be disposed perpendicular to a curvature of said seam when said inflatable supports are inflated.

18. The pneumatically inflatable structure of claim 17 wherein said support tubes and said bracing tubes are self-sealing by self-sealing means at ends of support tubes and said bracing tubes, said self-sealing means comprising ends of said inner resilient tubes which are folded over onto themselves, said ends of said tubes anchored by anchoring means to said ends of said first and second supports, said ends of said support tubes and said bracing tubes each formed as a flap hinge when said ends are mounted to said tent canopy.

19. The pneumatically inflatable structure of claim 17 wherein said inner resilient tubes are adapted, when mounted in said sleeves, to contain air pressurized to between 8 to 12 pounds per square inch.

20. The pneumatically inflatable structure of claim 1 further comprising a vestibule extending from an opening aperture of said pneumatically inflatable structure.