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(54) **Collapsible structures adapted for child use**

(57) A collapsible structure includes a first frame member defining a base of the structure and a second frame member defining a top of the structure. A piece of foldable material is attached to and extends between the first and second frame members. A plurality of foldable frame supporters is mounted on the piece of foldable material whereby folding of the frame supporters drives the first and second frame members towards a superimposed and collapsed position, and unfolding of the frame supporters drives the first and second frame members towards a spaced apart and expanded position. The collapsible structure can be in the form of a baby bed, a play pen, an igloo or a teepee.

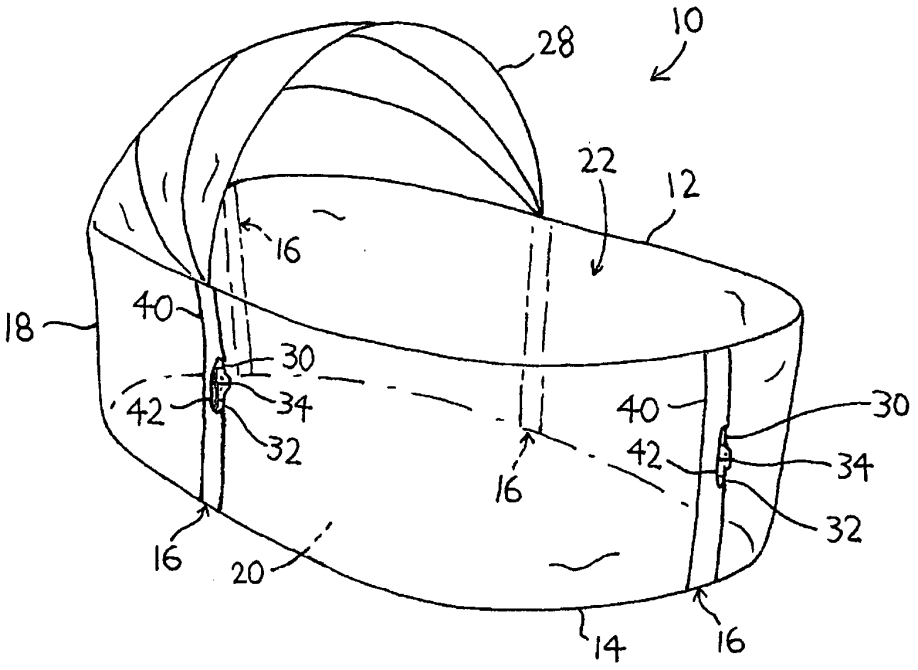

FIG. 1

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Description

[0001] The present invention relates to collapsible structures for child use such as a collapsible baby bed, infant playpen, children play tent and the like.

[0002] The present invention also relates to methods of collapsing and expanding the structure.

[0003] Collapsible structures are commonly used in collapsible baby beds, infant playpens, cribs, playhouses, tents, pavilions, shelters, sun shields, etc.

[0004] U.S. Patent No. 6,035,466 discloses a collapsible baby bed which includes a fabric cover covering a collapsible tubular frame. The frame includes a plurality of links which are coupled by a resilient cord such that when in use, the bed may take the form of a conventional crib or playpen. When the links are decoupled, the bed can be folded into a collapsed structure for storage or transport.

[0005] U.S. Patent No. 5,363,521 discloses a collapsible playpen having a pair of spaced apart articulated end frames, wherein the end frames are separated by articulated upper and lower rails. The end frames and rails are constructed so that the playpen is collapsed by folding the lower rails to draw lower portions of the end frames together and simultaneously rotating the upper portion of the opposing end frames away from each other such that the distance between the upper portion of the end frames is greater than the distance between the lower portion of the end frames.

[0006] U.S. Patent No. 3,810,482 discloses a collapsible tent structure in which both sidewalls, the rear wall and top are supported by nearly identical subframe assemblies, each of which has a length of stretchable cord fastening the ends of its jointed diagonally extending struts together. The struts of each subframe assembly are pivotally attached at their adjacent ends to a stop-forming connector at the intersection of the diagonals for foldable movement in one direction into side-by-side relation with one another while such connector limits their unfolded position to one in which they bear an angular relation of over 180° and less than approximately 220° to one another which position is maintained by the tension in the stretchable cord interconnecting the remote ends thereof. The cord preferably is reeved through marginal hems bordering the frame-supported walls thus defining a unitary foldable tent assembly. The frame itself comprises the four more or less identically constructed subframe assemblies pivotally interconnected to one another at their common corners together with the connectors for accomplishing the latter.

[0007] U.S. Patent No. 4,944,322 discloses another collapsible tent structure wherein a plurality of pole clusters is utilized. Each pole cluster has three poles which form an inverted Y-shape, the poles being loosely connected at the center of the inverted Y so that each of the arms may articulate relative to each other. The poles forming the two arms of each inverted Y extend to the ground and the poles forming the stems of each Y extend upwardly and are connected to each other at the top of the structure. A foldable membrane is provided which is connected to both ends of each pole by a clip whereby a foldable tent structure is provided which may be assembled and disassembled repeatedly without separating the foldable membrane from the poles.

[0008] According to one aspect of the present invention, there is provided a collapsible structure including a first frame member defining a base of the structure and a second frame member defining a top of the structure. A piece of foldable material is attached to and extends between the first and second frame members. A plurality of foldable frame supporters is mounted on the piece of foldable material whereby folding of the frame supporters drives the first and second frame members towards a superimposed and collapsed position, and unfolding of the frame supporters drives the first and second frame members towards spaced apart and expanded positions. Another piece of foldable material covers the first frame member.

[0009] The collapsible structure can also include hinge mechanisms provided on the first and second frame members for folding the collapsed and superimposed first and second frame members.

[0010] In one embodiment, the hinge mechanism can include a first pair of hinges provided on the first frame member, and a second pair of hinges provided on the second frame member.

[0011] In another embodiment, each of the foldable frame supporters can include a first section and a second section hingedly connected to the first section. The first and second sections can be configured to abut against each other when folded and to remain in an aligned or colinear relationship when unfolded.

[0012] In another embodiment, the first and second frame members can be in generally parallel and vertically spaced relationship and the plurality of foldable frame supporters are in a generally upright position when the structure is in the expanded position.

[0013] The collapsible structure can further include a collapsible hood member attached to the second frame member for at least partially covering the open top of the structure.

[0014] According to another aspect of the invention a collapsible child play enclosure is provided which comprises a plurality of frame assemblies, each of which includes a plurality of frame segments and a plurality of hinges connecting adjoining frame segments. The hinges are constructed and arranged to provide movement of the frame assemblies between assembled and collapsed positions. A piece of foldable material is secured to the frame members to enclose an interior space within the frame assemblies when in the assembled position, the frame segments of said frame assemblies are superimposed on one another in the collapsed position and can be folded into a compact state.

[0015] According to another aspect of the invention a method is provided for expanding and collapsing a struc-

ture intended for use by a child, which comprises assembling the structure with an enclosure for a child by a plurality of segments incorporating snap-lock hinges; providing a flexible covering on the structure, selectively assembling and collapsing the structure by locking or unlocking the hinges. The said hinges are selectively locked and unlocked by (1) aligning the segments of the structure connected by the hinges and (2) to lock the structure pivotably moving the segments out of alignment to collapse the structure to a folded condition, and when the segments are in the folded condition, they are superimposed on one another to provide a flat condition for the structure which can then be folded at the hinges to make the structure more compact.

[0016] Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings wherein:

[0017] FIG. 1 is a diagrammatic view of a collapsible baby bed in accordance with an embodiment of the present invention;

[0018] FIG. 2 shows the frames of the collapsible baby bed of FIG. 1;

[0019] FIG. 2A shows a hinge mechanism of the collapsible baby bed in a folded position;

[0020] FIG. 2B shows the hinge mechanism of the collapsible baby bed in an unfolded position;

[0021] FIGS. 3A-3E show the steps of folding the collapsible baby bed;

[0022] FIGS. 4A-4E show the steps of unfolding the collapsible baby bed;

[0023] FIG. 5 is a diagrammatic view of a collapsible infant play pen in accordance with another embodiment of the present invention;

[0024] FIG. 6 shows the frames of the collapsible infant play pen of FIG. 5;

[0025] FIGS. 7A-7C show the steps of folding the collapsible infant play pen;

[0026] FIGS. 8A-8C show the steps of unfolding the collapsible infant play pen;

[0027] FIG. 9 is a diagrammatic view of a collapsible igloo in accordance with an embodiment of the present invention;

[0028] FIG. 10 shows the frames of the collapsible igloo of FIG. 9;

[0029] FIGS. 11A-11D show the steps of folding the collapsible igloo;

[0030] FIGS. 12A-12D show the steps of unfolding the collapsible igloo;

[0031] FIG. 13 is a diagrammatic view of a collapsible teepee in accordance with another embodiment of the present invention;

[0032] FIG. 14 shows the frames of the collapsible teepee of FIG. 13;

[0033] FIG. 14A shows a hinge mechanism of the collapsible teepee of FIG. 13;

[0034] FIGS. 15A-15D show the steps of folding the collapsible teepee; and

[0035] FIGS. 16A-16D show the steps of unfolding the collapsible teepee.

[0036] In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings, which form a part thereof, and within which are shown by way of illustration specific embodiments by which the invention may be practices. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the invention.

[0037] Referring now to the drawings, in which like reference numerals represent like parts throughout the drawings, FIG. 1 is a diagrammatic view of a collapsible baby bed 10 in accordance with a preferred embodiment of the invention. The structure of the collapsible baby bed 10 includes a top frame 12, a bottom frame 14, and a plurality of frame supporters generally denoted by reference numeral 16.

[0038] In the illustrated embodiment, the top and bottom frames 12, 14 are in the shape of a closed loop. The top frame 12 defines an open top 22 of the collapsible baby bed 10, while the bottom frame 14 defines a base of the collapsible baby bed 10. Preferably, the top and bottom frames 12, 14 can be made of plastic tubes.

[0039] A sheet of foldable fabric material 18 is generally secured to the top and bottom frames 12, 14. The fabric sheet 18 generally extends between and along the loop-shaped top and bottom frames 12, 14. Preferably, the fabric sheet 18 can be made of nylon, polyester, or other materials that are durable and easy to clean. The fabric sheet 18 can be fastened to the top and bottom frames 12, 14 by conventional methods, including but not limited to zipping, stitching, etc.

[0040] FIG. 2 shows the frame structure of the collapsible baby bed 10. A plurality of frame supporters 16 are adapted to support the top and bottom frames 12, 14 of the collapsible baby bed 10 in an expanded position. In the illustrated embodiment, four frame supporter are used. Two frame supporters 16 are disposed on opposite sides of the collapsible baby bed 10. The other two frame supporters 16 are disposed on opposite ends of the collapsible baby bed 10.

[0041] In the illustrated embodiment, each frame supporter 16 includes a first section 30 and a second section 32 hingedly connected to the first section 30 by a hinge mechanism, generally designated by reference numeral 34. Preferably, each of the first and second sections 30, 32 is made of a plastic tube. It is to be understood that each frame supporter 16 can include more than two sections hingedly connected with each other.

[0042] In the illustrated embodiment, the frame supporter 16 can be adapted to be folded into a folded position where the first and second sections 30, 32 abut against each other, as depicted in FIG. 2A. The frame supporter 16 can also be adapted to be unfolded into an expanded or unfolded position where the first and second sections 30, 32 are in an aligned or colinear relationship, as depicted in FIG. 2B. When the frame supporters 16 are in their fully unfolded positions, the fabric sheet 18 is

stretched out and the top and bottom frames 12, 14 attached to the fabric sheet 18 are fully expanded.

[0043] As shown in FIGS. 2A and 2B, the hinge mechanism 34 generally includes a first hinge segment 50 and a second hinge segment 52. The first and second hinge segments 50, 52 are hingedly connected by a link 54. One end of the first hinge segment 50 is fixedly coupled to one end of the first section 30 of the frame supporter 16. Similarly, one end of the second hinge segment 52 is fixedly coupled to one end of the second section 32 of the frame supporter 16.

[0044] In the illustrated embodiment, projections 56, 58 are provided on the first and second hinge segments 50, 52 respectively. The projections 56, 58 serve to maintain the first and second sections 30, 32 in a colinear relationship when the frame supporter 16 is unfolded. The projections 56, 58 provide a snap-lock condition for the first and second sections in the expanded position of the baby bed.

[0045] Referring back to FIG. 1, each frame supporter 16 is preferably disposed within a tubular fabric cover 40 that is attached to the outer surface of the fabric sheet 18 by stitching. The tubular fabric cover 40 can include an opening 42 from which the hinge mechanism 34 of the frame supporter 16 may protrude and be visible. This opening 42 can facilitate the folding and unfolding of the frame supporters 16.

[0046] Although the use of one kind of hinge mechanism 34 has been described herein, it is appreciated that other kinds of hinge mechanisms may be employed.

[0047] Referring to both FIGS. 1 and 2, the opposite free ends 36, 38 of the frame supporter 16 is fastened within the opposite ends of the tubular cover 40, respectively. When the frame supporter 16 is in its fully unfolded position, the free ends 36, 38 generally abut against the top and bottom frames 12, 14 respectively. The length of the fully unfolded frame supporter 16 generally defines the height of the baby bed 10 when expanded.

[0048] In the illustrated embodiment, the top frame 12 includes a pair of hinges 60, while the bottom frame 12 also includes another pair of hinges 62. The pairs of hinges 60, 62 can be disposed in the middle of the loop-shaped frames 12, 14, so that the top frame and the bottom frame can be folded, respectively.

[0049] In the illustrated embodiment, a collapsible sun shield or hood 28 is attached to the top frame 12 so as to at least partially cover the open top 22 of the collapsible baby bed 10. Another sheet of fabric material 20 can be employed to cover the bottom frame 14. The fabric sheet 20 can form the bottom layer of the collapsible baby bed 10. Preferably, a cushion (not shown) can be provided on this bottom layer for comfort purposes.

[0050] Although it has been described that the top frame 12, the bottom frame 14, and the frame supporters 16 are made of plastic tubes, it is to be understood that the top frame 12, the bottom frame 14, and the frame supporters 16 may be made of other suitable materials, including but not limit to metal or plastic rods, wires, strips, bars, etc.

[0051] It has been described hereinbefore that the collapsible baby bed 10 has two loop-shaped frames 12, 14. However, it is understood that the number, the shape, and the size of these frames may vary. For example, the collapsible baby bed 10 may have one or more additional frames between the top and bottom frames 12, 14. The frames 12, 14 may be of other shapes, including but not limit to rectangular, circular, oval, etc. Furthermore, the sizes of the frames 12, 14 may be different. For example, the size of the top frame 12 may be larger than that of the bottom frame 14.

[0052] FIGS. 3A-3E show exemplary steps of collapsing and folding the baby bed 10 of the present invention. The four frame supporters 16 can first be folded, as shown by the arrows in FIG. 3B. The sun shield 28 can then be folded. When all the frame supporters 16 are folded, the top and bottom frames 12, 14 are collapsed into a generally superimposed position, as depicted in FIG. 3C. The collapsed and superimposed top and bottom frames 12, 14 can then be folded around the pairs of hinges 60, 62 provided on the top and bottom frames 12, 14 respectively, as shown by the arrow in FIG. 3D. Thereby, the superimposed frames 12, 14 form portions which are juxtaposed on one another and the overall length of the superimposed frames 12, 14 is reduced by one-half as shown in Fig. 3E.

[0053] FIGS. 4A-4E show exemplary steps of unfolding the collapsible baby bed 10. To unfold and set up the baby bed 10, the collapsed and folded baby bed 10 can be unfolded at hinges 60, 62, as shown by the arrow in FIG. 4B. Then, the four frame supporters 16 are unfolded one after the other, as shown by the arrows in FIG. 4D. When all the frame supporters 16 are unfolded, the top and bottom frames 12, 14 are brought into a vertically spaced apart and expanded position, as depicted in FIG. 4E. The sun shield 28 may be unfolded, if needed.

[0054] FIG. 5 is a diagrammatic view of a collapsible infant play article 100 in the form of a playpen. In the illustrated embodiment, the collapsible infant play article 100 can be an accordion-like, vertically collapsible and expandable play article with the simulation of an animal.

[0055] As best illustrated in FIG. 6, the infant play article 100 includes a top frame 112, a bottom frame 113, and a plurality of frame supporters 116. The infant play article 100 can optionally include one or more intermediate frames 114, 115. In the illustrated embodiment, the top, bottom and intermediate frames 112, 113, 114, 115 can be of circular shape. The top frame 112 defines an open top 122 of the collapsible infant play article 100, while the bottom frame 113 defines a base of the collapsible infant play article 100. The top, bottom and intermediate frames 112, 113, 114, 115 may be made of metal strips or other suitable materials.

[0056] Referring to both FIGS 5 and 6, a sheet of flexible fabric material 118 is fastened to the top, bottom and intermediate frames 112, 113, 114, 115. The fabric sheet 118 can extend between and around the top and bottom

frames 112, 113. The fabric sheet 118 is fastened to the top, bottom and intermediate frames 112, 113, 114, 115 by conventional methods, including but not limited to zipping, stitching, etc. Preferably, the fabric sheet 118 can be made of nylon, polyester, or other materials that are durable and easy to clean.

[0057] A plurality of frame supporters 116 are adapted to support the frames 112, 113, 114, 115 of the collapsible infant play article 100 in an expanded position. In the illustrated embodiment, there are three frame supporters 116 arranged equidistantly around the circular frames 112, 113, 114, 115.

[0058] Each frame supporter 116 includes a first section 130 and a second section 132 hingedly connected to the first section by a hinge mechanism generally designated by reference numeral 134. Preferably, each of the first and second sections 130, 132 is in the form of a plastic tube. The hinge mechanism 134 can be the same as the hinge mechanism 34 described hereinbefore and shown in FIGS. 2A and 2B. It is to be understood that each frame supporter 116 can include more than two sections hingedly connected with each other.

[0059] The frame supporter 116 can be folded into a folded position where the first and second sections 130, 132 abut against each other. The frame supporters 116 can also be unfolded into an unfolded position where the first and second sections 130, 132 are disposed in an aligned colinear relationship. When the frame supporters 116 are in their fully unfolded positions, the fabric sheet 118 is stretched out and the frames 112, 113, 114, 115 attached to the fabric sheet 118 are fully expanded.

[0060] Each frame supporter 116 can be covered by a tubular cover 140 made of fabric material. The two opposite ends of each tubular cover 140 can be attached, preferably by stitching, to the inner surface of the fabric sheet 118 immediate adjacent to the top and bottom frames 112, 113 respectively. The tubular cover 140 has an opening 142 from which the hinge mechanism 134 of the frame supporter 116 may protrude and be visible. The opposite free ends 136, 138 of the frame supporter 116 can be fastened within the opposite ends of the tubular cover 140 respectively.

[0061] A collapsible hood 128 can be attached to the top frame 112 and can fully or partially cover the open top 122 of the collapsible infant play article 100. A fabric sheet 120 can be employed to cover the bottom frame 113 to form the bottom layer of the collapsible infant play article 100. Optionally, a window or netted panel 124 can be provided on the collapsible infant play article 100.

[0062] Although it has been disclosed hereinbefore that the top frame 112, the bottom frame 113, and the intermediate frames 114, 115 are made of metal strips, it is to be understood that they may be made of other suitable materials, including but not limit to metal or plastic tubes, rods, wires, etc.

[0063] Although it has been described that the hinge mechanism 134 may be the same as the hinge mechanism 34 shown in FIGS. 2A and 2B, it is appreciated that other kinds of hinge mechanisms may be employed.

[0064] Also, it has been described that the collapsible infant play article 100 has four circular frames 112, 113, 114, 115 which in the expanded state of the play article 100 form a cylindrical volume in the interior of the play article. However, it is to be understood that the number, shape, and size of the frames may vary. For example, the collapsible infant play article 100 may have more or less than four circular frames. The frames 112, 113, 114, 115 may be of non-circular shape. Furthermore, the sizes of the frames 112, 113, 114, 115 may be different.

[0065] It is also to be understood that the collapsible infant play article 100 may have more or less than three frame supporters 116.

[0066] FIGS. 7A-7C show the steps of folding the collapsible infant play article 100 of the present invention. The three frame supporters 116 are first folded one by one, as illustrated by the arrows in FIGS. 7B. The hood 128 can then be folded onto the top frame 112. When all the frame supporters 116 are folded, the top, bottom and intermediate frames 112, 113, 114, 115 can collapse into a generally superimposed position, as depicted in FIG. 7C.

[0067] FIGS. 8A-8C show the reverse steps of unfolding the collapsible infant play article 100. To unfold and set up the infant play article 100, the three frame supporters 116 are unfolded one after the other, as illustrated by the arrows in FIG. 8B. The hood 128 can then be unfolded. When all the frame supporters 116 are unfolded, the top, bottom and intermediate frames 112, 113, 114, 115 are brought into a vertically spaced apart and expanded position, as shown in FIG. 8C.

[0068] FIG. 9 is a diagrammatic view of a collapsible igloo 200 in accordance with an embodiment of the present invention. The igloo is in the form of a generally dome-shaped structure such as a tent.

[0069] As shown in FIG. 10, the collapsible igloo 200 includes a first frame assembly generally designated by reference numeral 300 and a second frame assembly generally designated by reference numeral 400. In the illustrated embodiment, the first and second frame assemblies 300, 400 are arc-shaped, for example, semi-circular, when fully unfolded and expanded. A sheet of fabric material 500, or any other suitable material, is secured on the first and second frame assemblies 300, 400 of the collapsible igloo 200.

[0070] In accordance with the present invention, the first frame assembly 300 and second frame assembly 400 each includes a plurality of segments hingedly connected with each other. In the illustrated embodiment, the first frame assembly 300 includes six frame segments 310, 312, 314, 316, 318, 320 hingedly connected together by hinge mechanisms represented by circled block numbers 1, 2 and 3. Similarly, the second frame assembly 400 includes six frame segments 410, 412, 414, 416, 418, 420 hingedly connected together by hinge mechanisms represented by circled block numbers 1, 2, 3. Preferably, the frame segments 310, 312, 314, 316, 318, 320,

410, 412, 414, 416, 418, 420 can be made of plastic tubes.

[0071] In the illustrated embodiment, each of the hinge mechanisms represented by block numbers 1, 2, 3 of the first and second frame assemblies 300, 400 can be the same as the hinge mechanism 34 as depicted in FIGS. 2A and 2B. For easy reference, the hinge mechanisms 1, 2, 3 are designated by numbers according to a preferred folding sequence. In other words, the frame segments are preferably folded at hinge mechanisms 1 initially, then at hinge mechanisms 2, and finally at hinge mechanisms 3.

[0072] The frame segments 310, 320 can be the two ground-engaging frame segments of the first hinge assembly 300. These two ground-engaging frame segments 310, 320 can be adapted to engage the ground when the igloo 200 is in use and in its expanded position. The ground-engaging frame segments 310, 320 are hingedly connected to frame segments 312, 318 respectively by hinge mechanisms 3. The frame segments 312, 318 are hingedly connected to frame segments 314, 316 respectively by hinge mechanisms. Finally, the two frame segments 314, 316 are hingedly connected together by hinge mechanism 1 which is the middle hinge mechanism at the peak of the first hinge assembly 300.

[0073] Similarly, the frame segments 410, 420 are the two ground-engaging frame segments of the second hinge assembly 400. These two ground-engaging frame segments 410, 420 are adapted to engage the ground when the igloo 200 is in use and in its expanded position. The ground-engaging frame segments 410, 420 are hingedly connected to frame segments 412, 418 respectively by hinge mechanisms 3. The frame segments 412, 418 are, in turn, hingedly connected to frame segments 414, 416 respectively by hinge mechanisms 2. Finally, the two frame segments 414, 416 are hingedly connected together by the hinge mechanism 1 which is the middle hinge mechanism of the second hinge assembly 400.

[0074] FIGS. 11A-11D show the steps of folding the collapsible igloo 200. To collapse the collapsible igloo 200, the first frame assembly 300 is initially folded at hinge mechanism 1 thereof, as indicated by the arrow in FIG. 11A, thereby bringing frame segments 310, 312, 314 towards frame segments 316, 318, 320, respectively. The second frame assembly 400 is then folded at hinge mechanism 1 thereof, as illustrated by the arrow in FIG. 11B, thereby bringing frame segments 410, 412, 414 towards frame segments 416, 418, 420, respectively.

[0075] The first and second frame assemblies 300, 400 can then be brought into a generally collapsed and superimposed relationship where the four hinge mechanisms 2 are grouped together into a first group and the four hinge mechanisms 3 are grouped together into a second group. The collapsed and superimposed first and second frame assemblies 300, 400 can then be folded at hinge mechanisms 2, as shown by the arrow in FIG. 11C. Finally, the first and second frame assemblies 300, 400 can be folded at hinge mechanisms 3, as indicated by the arrow in FIG. 11D. The igloo is now in a collapsed state with the adjacent frame assemblies folded into a compact arrangement.

[0076] FIGS. 12A-12D show the reverse steps of unfolding the collapsed and folded igloo 200 of FIG. 9.

[0077] It is appreciated that the collapsible igloo 200 is easy to set up and fold due to the particular arrangement of the frame segments and the application and grouping of the hinge mechanisms.

[0078] Although it has been described that the collapsible igloo 200 has two frame assemblies 300, 400 each having six frame segments 310, 312, 314, 316, 318, 320, 410, 412, 414, 416, 418, 420, it is appreciated that the numbers of frame assemblies and frame segments may vary. For example, there may be more than two frame assemblies and more or less than six frame segments in each frame assembly.

[0079] Although it has been described that the frame segments 310, 312, 314, 316, 318, 320, 410, 412, 414, 416, 418, 420 are made of plastic tubes, it is appreciated that these frame segments may be made of other materials, such as metal tubes or metal/plastic rods.

[0080] Although it has been described that the hinge mechanisms 1, 2, 3 are the same as the hinge mechanism 34 shown in FIGS. 2A and 2B, it is appreciated that other kinds of hinge mechanisms may be employed which provide a locking feature when unfolded.

[0081] FIG. 13 is a diagrammatic view of a collapsible teepee 600 in accordance with another embodiment of the present invention. A teepee is a Native American tent of pyramid shape. The term "teepee" is used herein to denote a children play tent resembling a teepee.

[0082] As depicted in FIG. 14, the collapsible teepee 600 includes a ground-engaging frame structure generally represented by reference numeral 602, and a plurality of supporting frame assemblies generally designated by reference numeral 604. A sheet of fabric material 960, or any other suitable materials, can be mounted on the frames of the collapsible teepee 600.

[0083] The ground-engaging frame structure 602 includes a plurality of sides each having a plurality of frame segments hingedly connected together by hinge mechanisms. In the illustrated embodiment, the ground-engaging frame structure 602 has four sides each having two frame segments. The frame segments 710, 712 are hingedly connected together by a hinge mechanism 1. The frame segments 714, 716 are disposed on the opposite side of the frame segments 710, 712 and are hingedly connected together by another hinge mechanism 1.

[0084] Furthermore, frame segments 718, 720 are hingedly connected together by a hinge mechanism 2. The frame segments 722, 724 are disposed on the opposite side of the frame segments 718, 720 and are hingedly connected together by another hinge mechanism 2.

[0085] The sides of the ground-engaging frame structure 602 are hingedly connected together at the corners

by hinge mechanisms 734.

[0086] Each supporting frame assembly 604 includes a plurality of frame segments. In the illustrated embodiment, each supporting frame assembly 604 includes an upper frame segment 910, a middle frame segment 912, and a lower frame segment 914. The upper and middle frame segments 910, 912 are hingedly connected together by hinge mechanisms 3. The middle and lower frame segments 912, 914 are hingedly connected together by hinge mechanisms 4.

[0087] The supporting frame assemblies 604 are hingedly connected to the corners of the ground-engaging frame structure 602 respectively by the hinge mechanisms 734. The free ends of the supporting frame assemblies 604 can be grouped together to form the tip 930 of the collapsible teepee 600. Preferably, the frame segments 710, 712, 714, 716, 718, 720, 722, 724, 910, 912, 914 are made of plastic tubes.

[0088] As shown in FIG. 14A, the hinge mechanism 734 includes a first hinge segment 750, a second hinge segment 752, and a third hinge segment 754. The first, second and third hinge segments 750, 752, 754 are hingedly connected by a link 756. One end of the first hinge segment 750 is fixedly coupled to one end of a frame segment of the ground-engaging frame structure 602. One end of the second hinge segment 752 is fixedly coupled to one end of another frame segment of the ground-engaging frame structure 602. One end of the third hinge segment 754 is fixedly coupled to one end of frame segment 914 of supporting frame assembly 604.

[0089] Projections 760, 762 are provided on the first and second hinge segments 750, 752 respectively. The projections 760, 762 limit the two connecting frame segments of the ground-engaging frame structure 602 in a predefined relationship when the ground-engaging frame structure 602 is unfolded.

[0090] Referring back to FIG. 14, in the illustrated embodiment, each of the hinge mechanisms 1, 2, 3, 4 of the collapsible teepee 600 can be the same as the hinge mechanism 34 as depicted in FIGS. 2A and 2B. For easy reference, the hinge mechanisms 1, 2, 3, 4 are designated by numbers according to a preferred folding sequence. In other words, the frame segments are initially folded at hinge mechanisms 1 and 2, then at hinge mechanisms 3, and finally at hinge mechanisms 4.

[0091] FIGS. 15A-15D show the steps of folding the collapsible teepee 600 of the present invention. To collapse the collapsible teepee 600, the ground-engaging frame members 602 are initially folded at hinge mechanisms 1 as illustrated by the arrows in FIG. 15A, and then at hinge mechanisms 2 as illustrated by the arrows in FIG. 15B to form a collapsed teepee. The collapsed teepee 600 can then be folded at hinge mechanisms 3, as shown by the arrow in FIG. 15C. Finally, the collapsed and folded teepee 600 can further be folded at hinge mechanisms 4, as shown by the arrow in FIG. 15D.

[0092] FIGS. 16A-16D show the reverse steps of unfolding the collapsible teepee 600.

[0093] It is appreciated that the collapsible teepee 600 is easy to set up and fold due to the particular arrangement of the frame segments and the application and grouping of the hinge mechanisms.

[0094] Although it has been shown that the collapsible teepee 600 has a rectangular ground-engaging structure 602, it is appreciated that the shape of the ground-engaging structure may vary. For example, the ground-engaging frame structure may be circular in shape for the formation of a conical-shaped teepee. Furthermore, each supporting frame assembly 604 may have more or less than three frame segments.

[0095] Although it has been described that the frame segments 710, 712, 714, 716, 718, 720, 722, 724, 910, 912, 914 are made of plastic tubes, it is appreciated that these frame segments may be made of other materials such as metal tubes or metal/plastic rods.

[0096] Although it has been described that the hinge mechanisms 1, 2, 3, 4 are the same as the hinge mechanism 34 shown in FIGS. 2A and 2B, it is appreciated that other kinds of hinge mechanisms may be employed.

[0097] While the present invention has been shown and described with particular references to a number of preferred embodiments thereof, it should be noted that various other changes or modifications may be made without departing from the scope of the present invention.

Claims

1. A collapsible structure comprising:

a first frame member defining a base of the structure;

a second frame member defining a top of the structure;

a piece of foldable material attached to and extending between said first and second frame members; and

a plurality of foldable frame supporters connected to said first and second frame members and to said piece of foldable material, said frame supporters being foldable to move said first and second frame members towards one another to a superimposed and collapsed position, and being unfolded to move said first and second frame members away from one another to a spaced and expanded position.

2. A collapsible structure according to claim 1 comprising hinges in said foldable frame supporters which enable the frame supporters to move the first and second frame members between said collapsed and expanded positions.

3. A collapsible structure according to claim 2 where in said hinges include projections to serve as stops to limit movement of the frame members to said ex-

panded position and provide a lock engagement of the hinges

4. A collapsible structure according to claim 3 wherein said foldable frame supporters each comprises a first segment having one end fixed to said first frame member and a second segment having one end fixed to said second frame member, and a link hingeably connected to said first and second segments at ends thereof opposite said ends fixed to the frame members.

5. A collapsible structure according to claim 4 wherein said segments are adjacent to one another in said collapsed position and are colinear in said expanded position.

6. The collapsible structure according to claim 1 wherein said first and second frame members include respective hinges which enable the first and second frame members to be jointly folded when in said superposed and collapsed position to reduce size of the structure in said collapsed position.

7. A collapsible structure according to claim 1 wherein said frame members define a circumferentially enclosed space with an open top in said expanded position to enable the structure to serve as a baby bed.

8. A collapsible structure according to claim 7 wherein said foldable frame supporters are spaced circumferentially around the structure.

9. A collapsible structure according to claim 1 wherein said first and second frame members are annular and said frame supporters have a length to define an interior space within the foldable material to serve as a play area for a child.

10. A collapsible structure according to claim 9 wherein said play area comprises a cylindrical volume.

11. A collapsible structure according to claim 9 wherein said frame supporters are arranged to fold inwardly to permit the frame members to move to the collapsed position.

12. A collapsible structure comprising:

a plurality of frame assemblies;
each frame assembly including a plurality of frame segments and a plurality of hinges connecting adjoining frame segments, said hinges being constructed and arranged to provide movement between assembled and collapsed positions;
a piece of foldable material secured to said frame members to enclosed an interior space within the frame assemblies when in said assembled position, said frame segments of said frame assemblies being superimposed on one another in said collapsed position.

13. The collapsible structure according to claim 12 wherein said frame segments include curved segments to confer a rounded shape to said collapsible structure which simulates an igloo.

14. A collapsible structure according to claim 13 wherein said frame segments of said frame assemblies include lower frame segments having lower ends adapted for supporting said collapsible structure on the ground in the assembled position.

15. A collapsible structure according to claim 13 wherein said hinges include projections to serve as stops to limit movement of the frame segments in said assembled position and provide a lock engagement of the hinges.

16. A collapsible structure according to claim 13 wherein the frame segments of each frame member confer a substantially semi-circular shape to the frame member.

17. A collapsible structure according to claim 16 wherein each frame member has a peak with a said hinge thereat and the frame member extends in opposite directions from said peak along curved paths, each of which includes two said hinges connecting adjoining frame segments.

18. A collapsible structure according to claim 12 further comprising a ground engaging frame structure including a plurality of ground engaging members said frame assemblies being connected to said ground engaging frame structure to provide a pyramidal shape for said collapsible structure to simulate a teepee.

19. A collapsible structure according to claim 18 wherein said ground engaging frame structure has corners at adjoining ground engaging members at which a respective said frame segment is disposed, a first of said hinges pivotably connects the adjoining ground engaging members to one another and said respective frame segment to said adjoining ground engaging members.

20. A collapsible structure according to claim 19 wherein a second of said hinges is provided in each ground engaging member to form ground segments which are pivotable between collapsed and extended positions.

21. A collapsible structure according to claim 20 wherein

each said frame assembly includes a plurality of said second hinges.

22. A collapsible structure according to claim 21 wherein said ground members are inwardly foldable at said second hinges and said frame assemblies are superimposable on one another and capable of being folded around said second hinges to collapse said collapsible structure.

23. A method for expanding and collapsing a structure intended for use by a child, said method comprising:

assembling a structure having an enclosure for a child;
forming said structure with a plurality of segments incorporating hinges movable between folded and unfolded positions;
providing a flexible fabric cover on the structure ; and
selectively expanding and collapsing the structure by unfolding and folding the hinges,

wherein said hinges are selectively unfolded and folded by (1) aligning segments of the structure connected by the hinges and (2) by pivotably moving the segments out of alignment, and
wherein when said segments are in the folded condition, the segments are superimposed on one another to provide a flat, collapsed condition for the structure.

24. The method according to claim 23 wherein in the expanded condition, the structure forms a baby bed.

25. The method according to claim 23 wherein in the expanded condition, the structure forms a play pen.

26. The method according to claim 23 wherein in the expanded condition, the structure forms an igloo.

27. The method according to claim 23 wherein in the expanded condition, the structure forms a teepee.

28. The method according to claim 23 comprising folding the segments in the collapsed condition of the structure to reduce size of the structure and make it more compact.

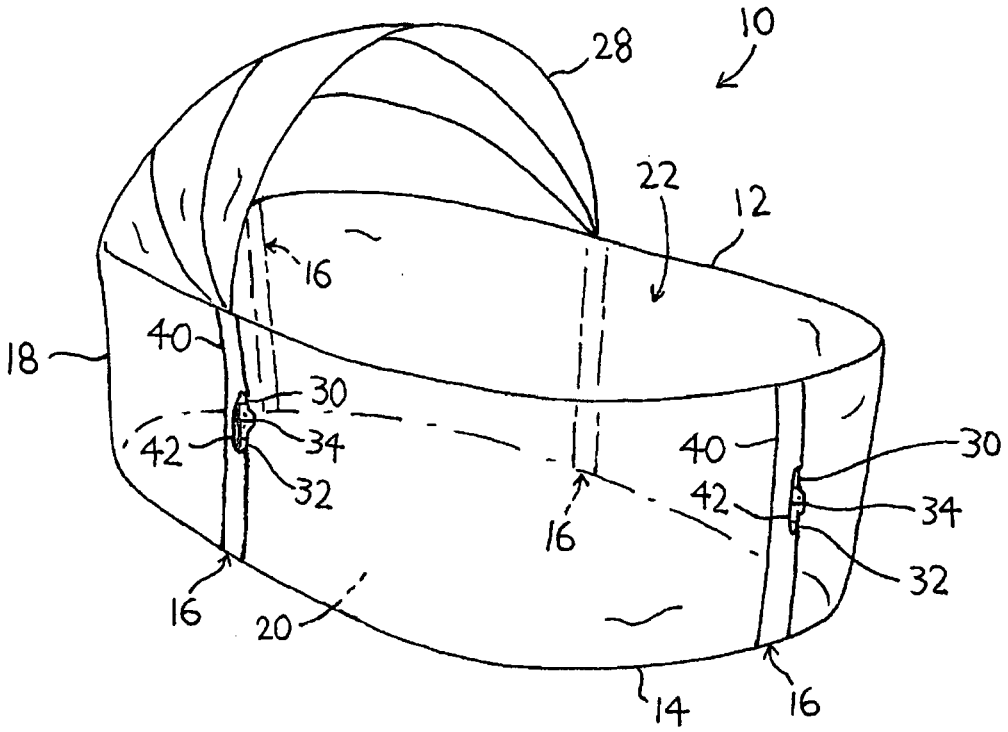

FIG. 1

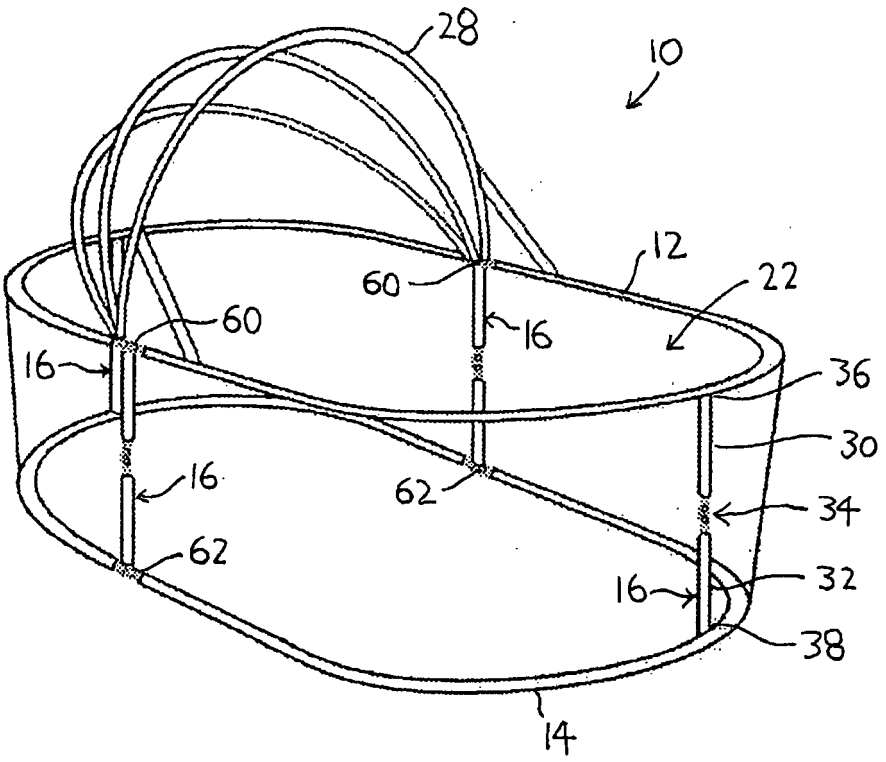

FIG. 2

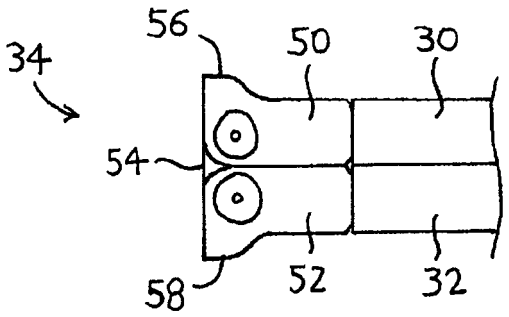

FIG. 2A

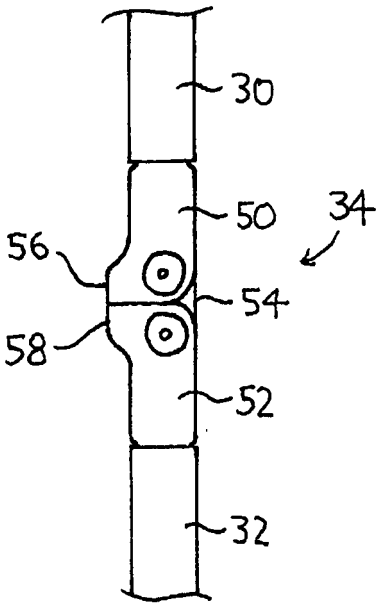

FIG. 2B

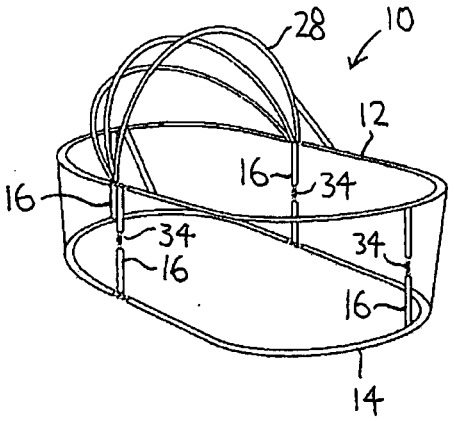

FIG. 3A

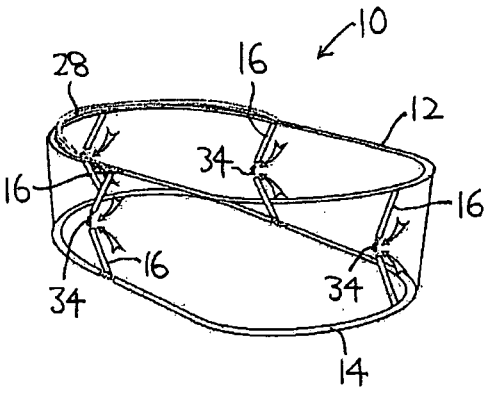

FIG. 3B

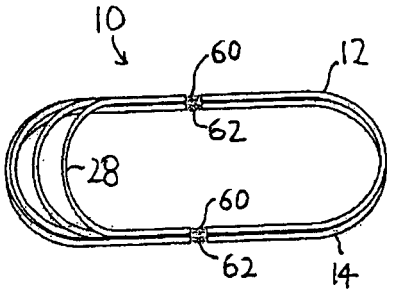

FIG. 3C

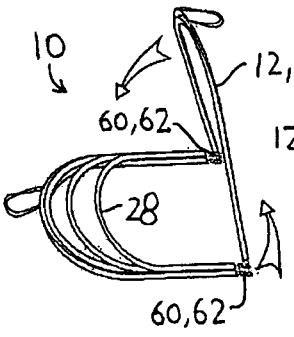

FIG. 3D

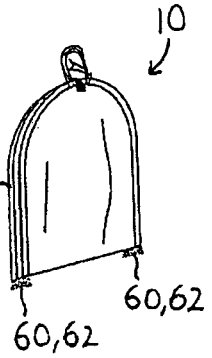

FIG. 3E

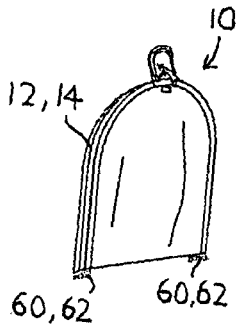

FIG. 4A

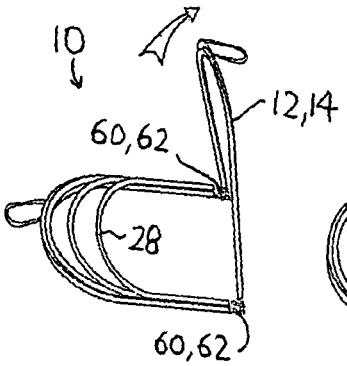

FIG. 4B

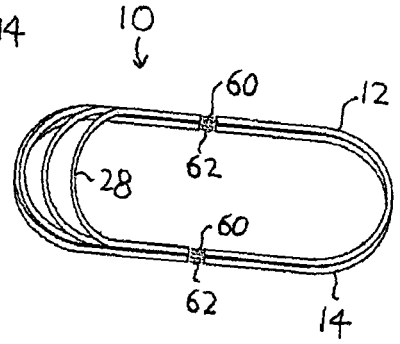

FIG. 4C

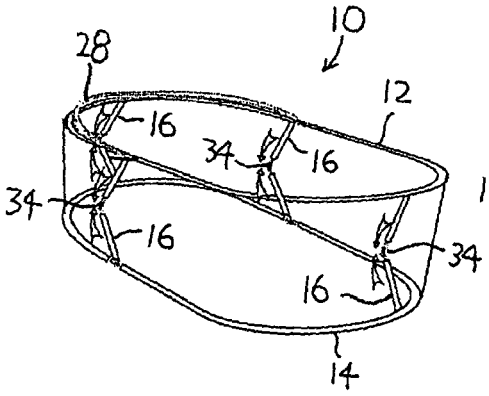

FIG. 4D

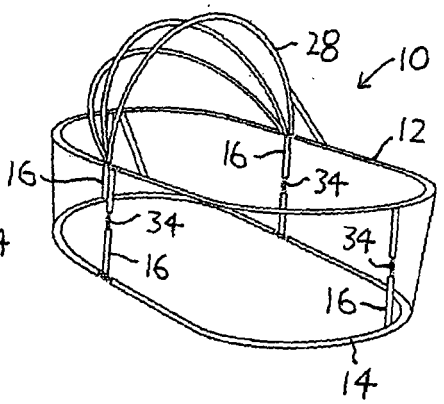

FIG. 4E

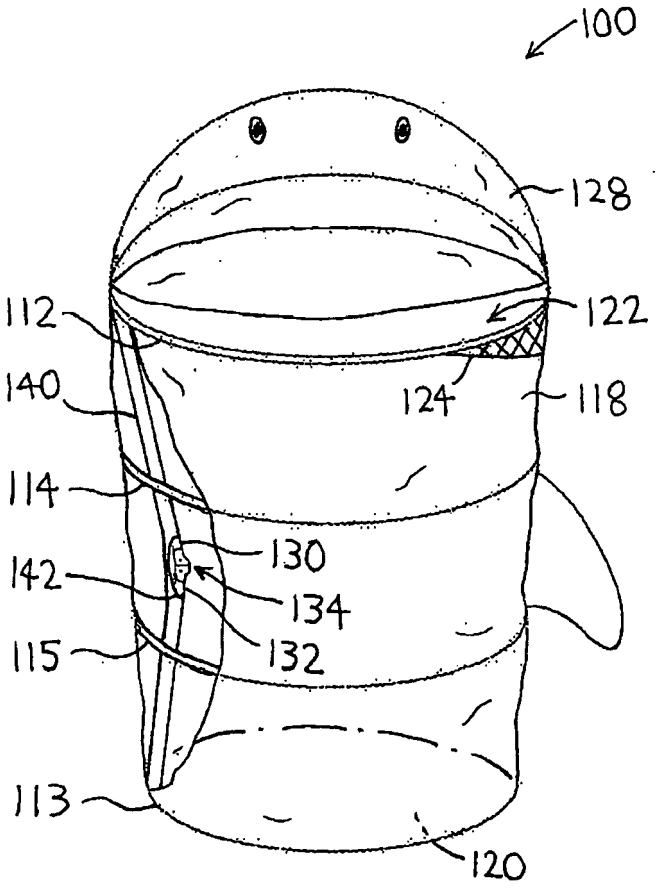

FIG. 5

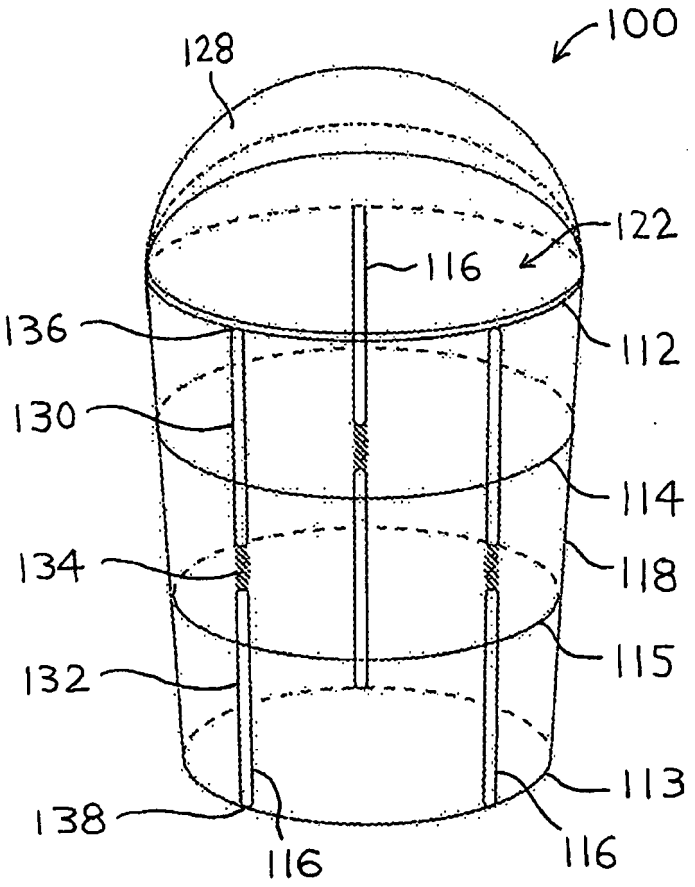

FIG. 6

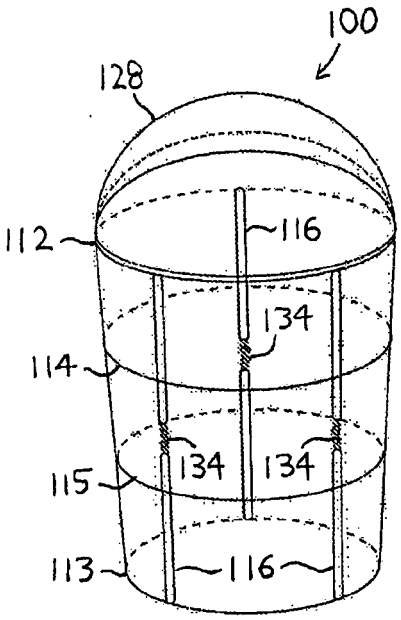

FIG. 7A

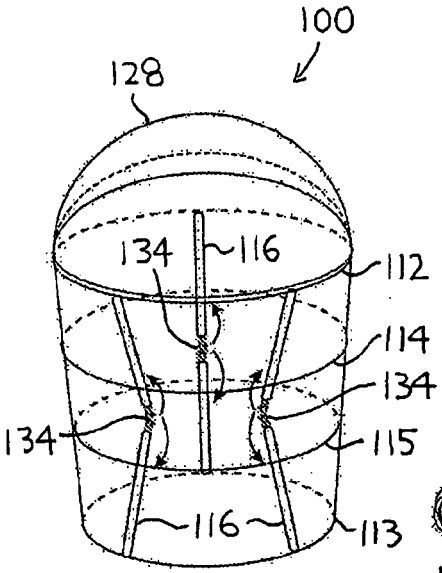

FIG. 7B

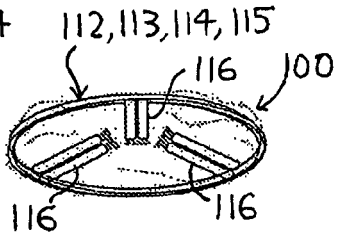

FIG. 7C

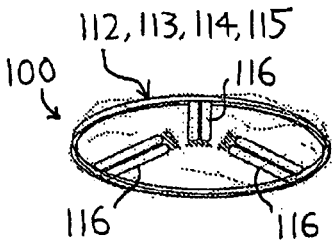

FIG. 8A

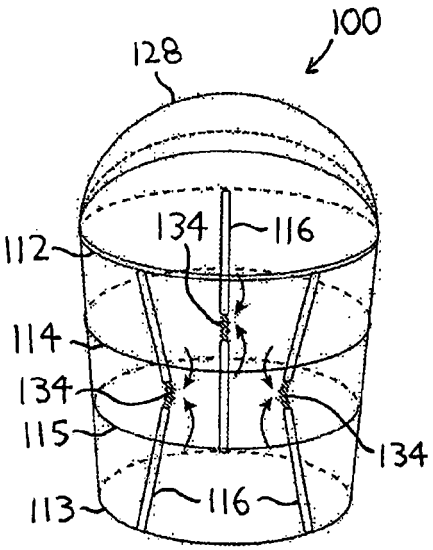

FIG. 8B

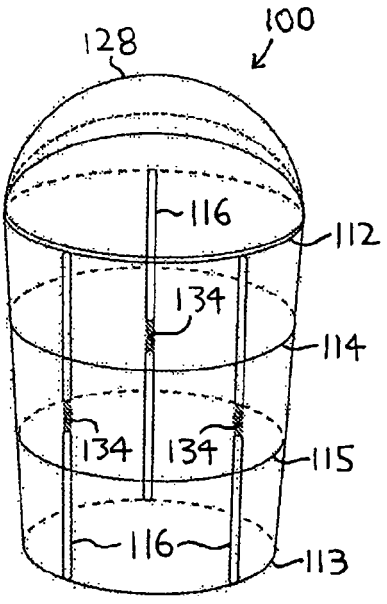

FIG. 8C

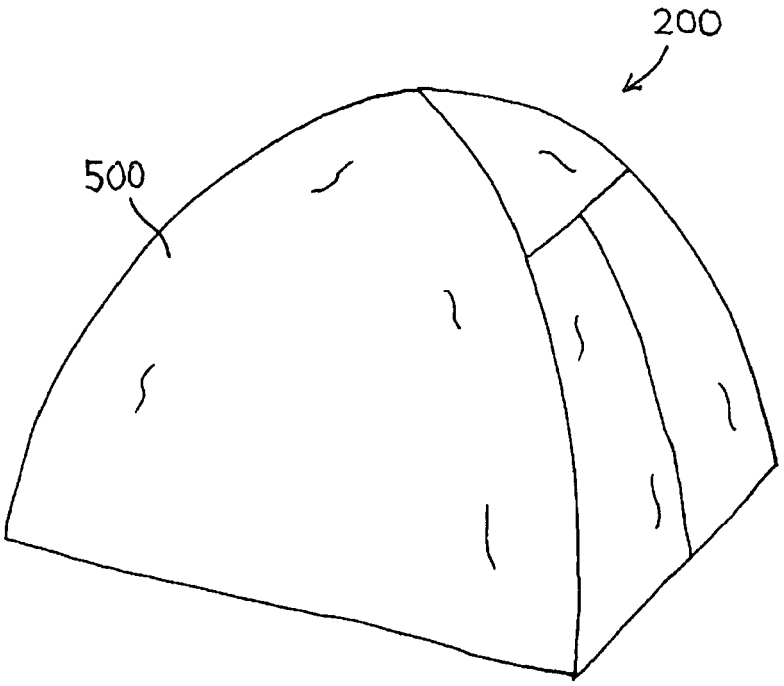

FIG. 9

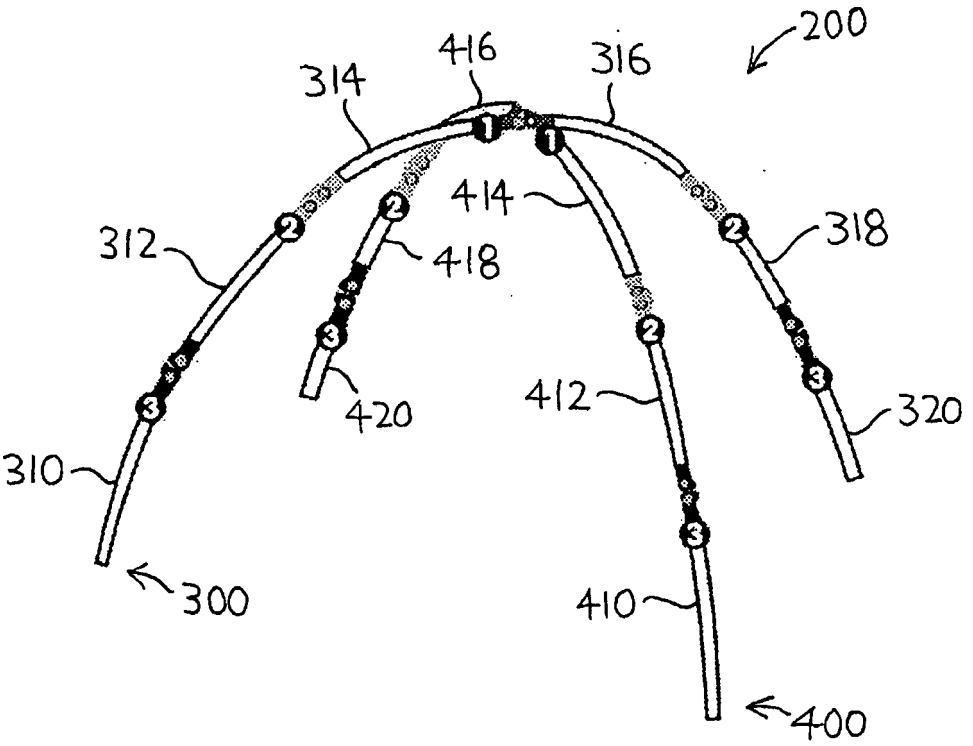

FIG. 10

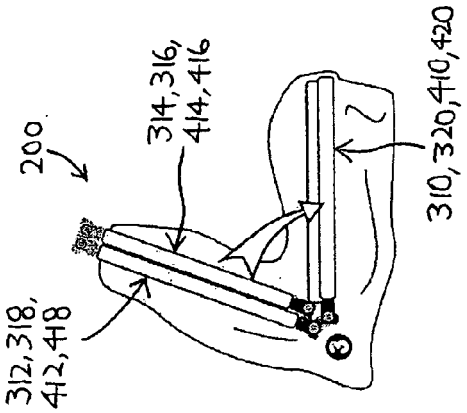

FIG. 11D

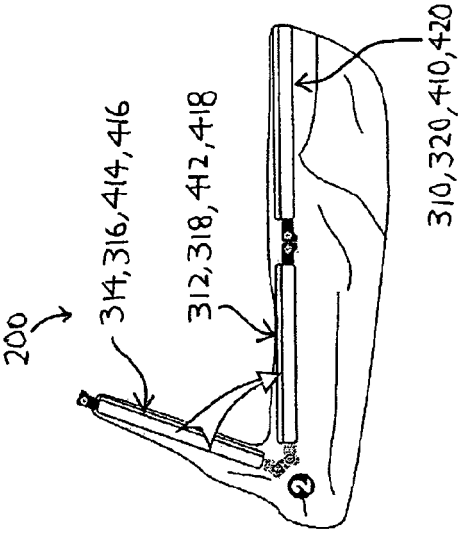

FIG. 11C

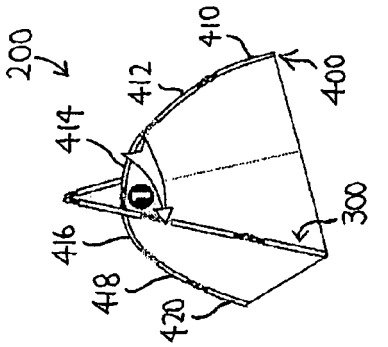

FIG. 11B

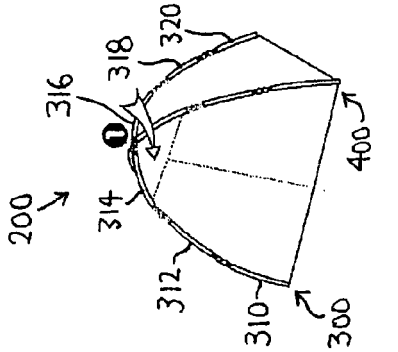

FIG. 11A

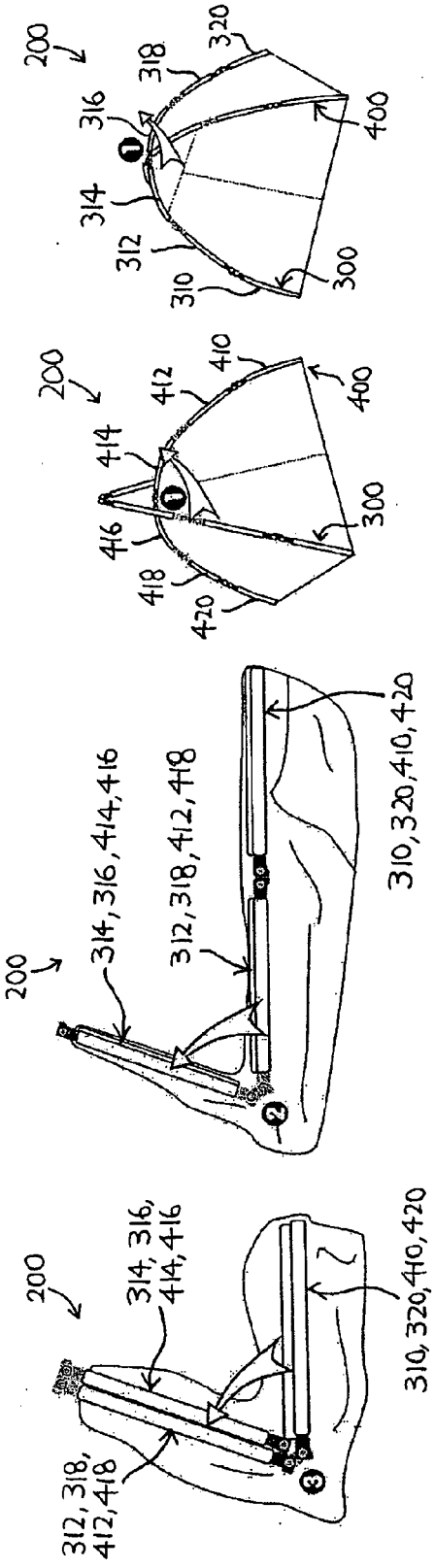

FIG. 12A

FIG. 12B

FIG. 12C

FIG. 12D

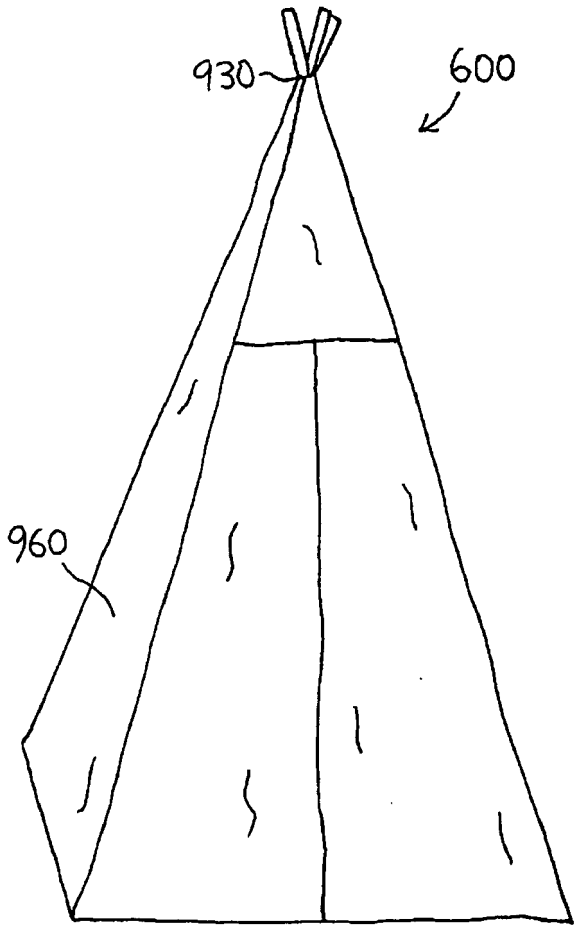

FIG. 13

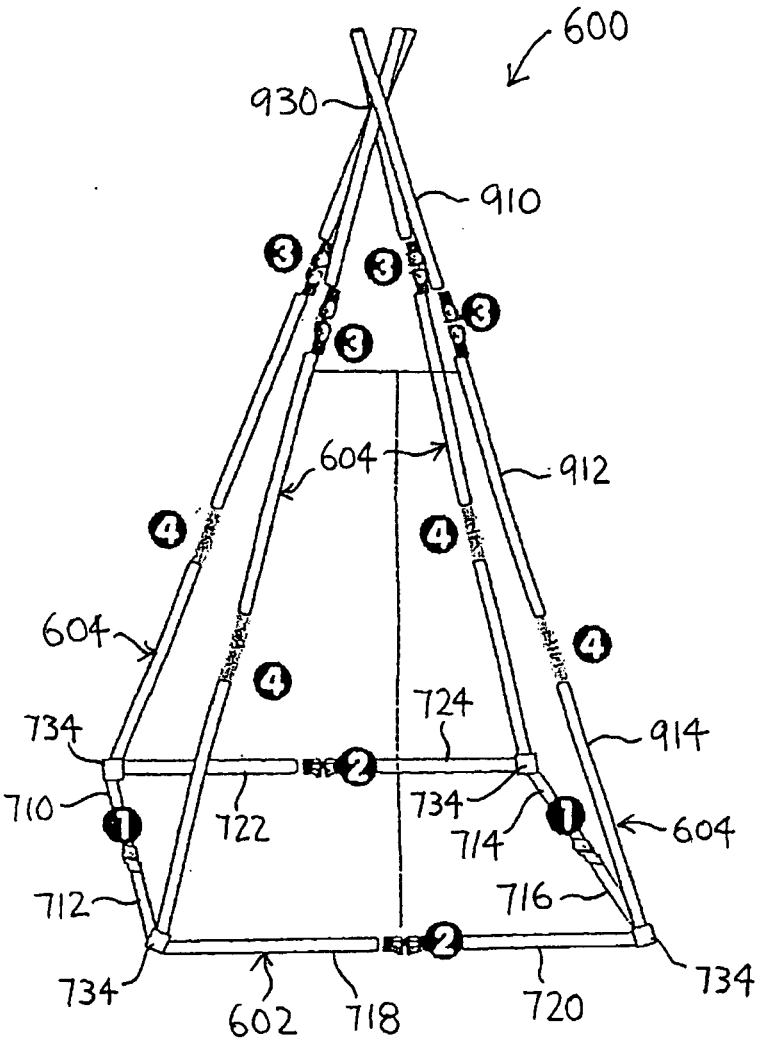
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FIG. 14

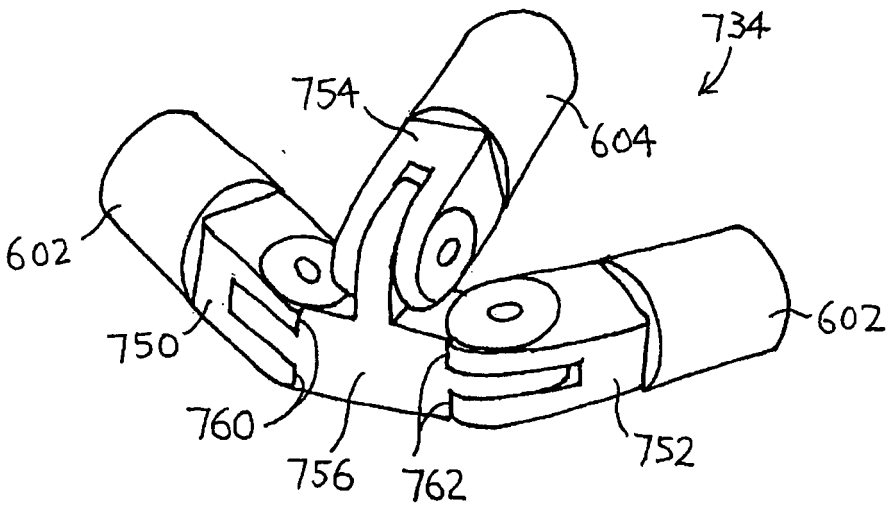

FIG. 14A

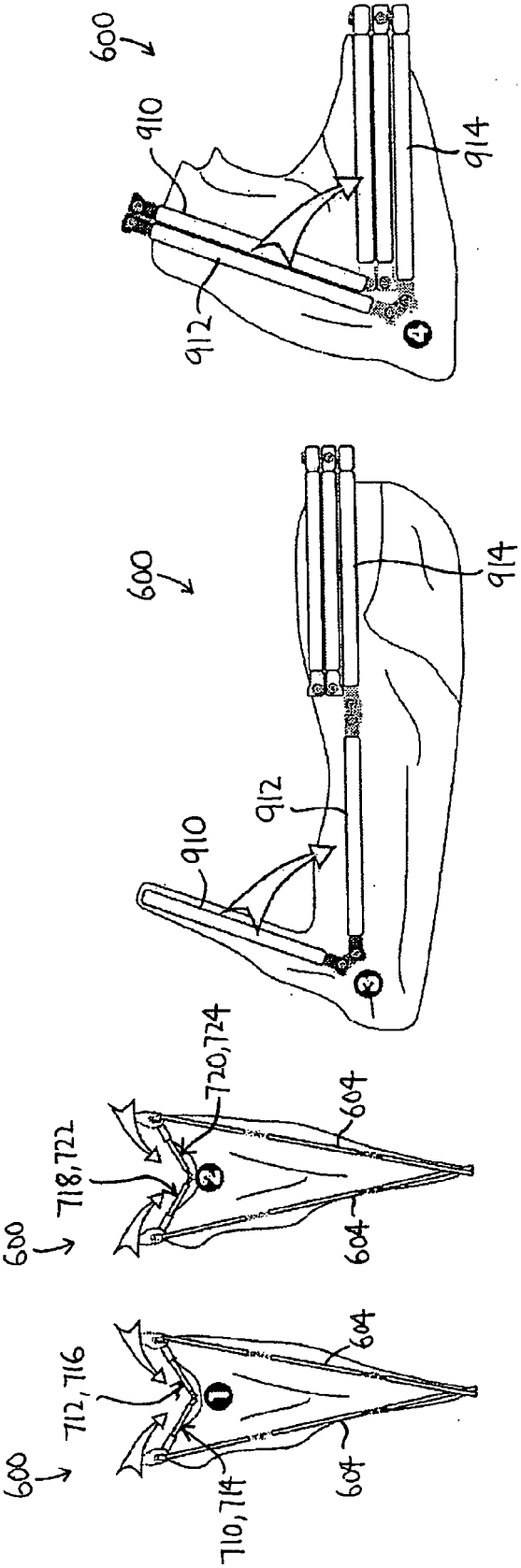

FIG. 15A FIG. 15B FIG. 15C FIG. 15D

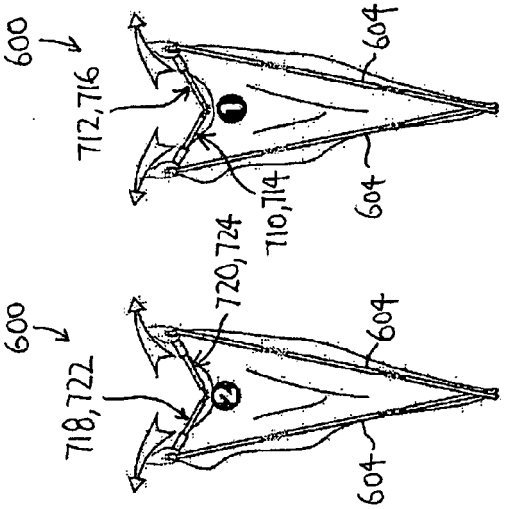

FIG. 16D

FIG. 16C

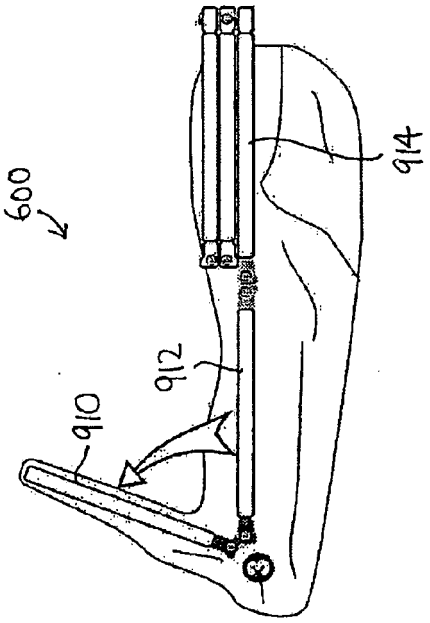

FIG. 16B

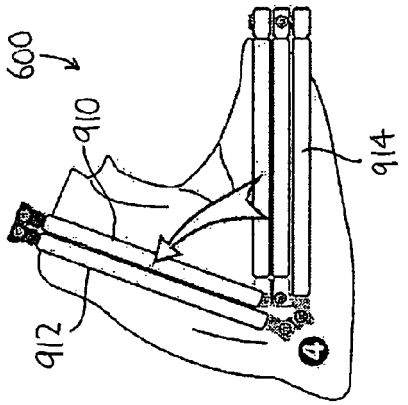

FIG. 16A

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6035466 A **[0004]**
- US 5363521 A **[0005]**
- US 3810482 A **[0006]**
- US 4944322 A **[0007]**