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(54) **Self-supporting self-standing structure**

(57) A self-supporting structure (100) comprising first and second resilient loops (110 and 120) intersecting with each other at two positions (A and B). Each of the loops (110 and 120) is self-expanding by virtue of its resilience. The structure (100) includes flexible panels (140 to 170) extending across the loops (110 and 120) for stretching to limit the extent to which the loops (110

and 120) expand in space into a self-standing expanded configuration for use. The loops (110 and 120) are capable of being pivoted to lie substantially flat with each other and then coiled into a plurality of much smaller turns into a collapsed configuration for storage.

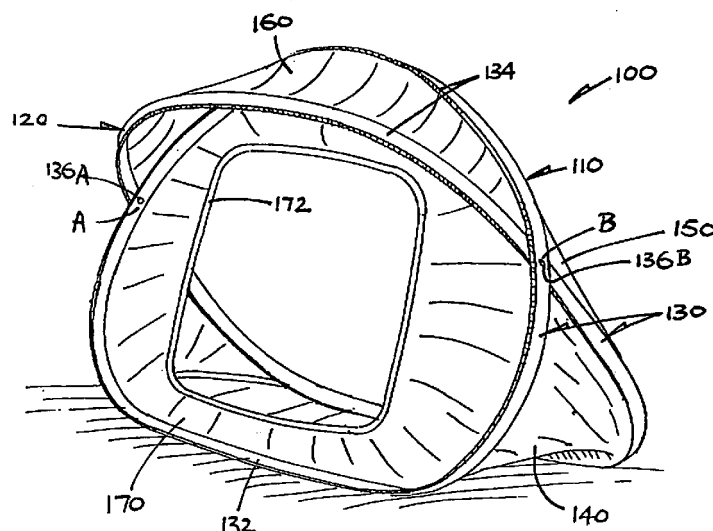


FIG. 4

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Description

[0001] The present invention relates to a self-supporting self-standing structure which may be formed by resilient loops.

BACKGROUND OF THE INVENTION

[0002] Self-supporting structures formed by resilient loops are known, for example as disclosed in United States Patents Nos. 4,815,784, 4,825,892, 5,038,812 and 5,427,381.

[0003] The present invention seeks to provide a novel or improved self-supporting structure of this type in general, which is sturdy and has different or simpler construction and or has flexibility to allow multiple applications and can suitably be adapted for use for various purposes.

SUMMARY OF THE INVENTION

[0004] In accordance with one aspect of the present invention, there is provided a self-supporting self-standing structure. The structure comprises a first loop which substantially defines a first plane and a second loop which substantially defines a second plane. The first and second loops are arranged in a cross configuration with the first and second planes intersecting each other and the first and second loops providing support for each other forming a stand-up frame for the structure.

[0005] Conveniently, in the stand-up frame formation, the first and second loops are fixed relative or with respect to each other. Further, in the stand-up frame formation, the first and second loops are also connected to or intersect each other at respective first locations on the first and second loops and at respective second locations on the first and second loops.

[0006] In practice, the first and second locations on each of the first and second loops are positioned symmetrically on opposite sides of each of the first and second loops. Preferably, the first and second locations on one of the first and second loops are positioned on an upper half portion of said one loop.

[0007] Both the first and second loops can advantageously be made of resilient material, for example bendable steel or metal strip. Therefore, in one embodiment, the first and second loops are connected to each other with connecting member which may allow the stand-up frame to be collapsed into substantially a stack of loops. The stack of loops can be coiled into a pack. Preferably, the connecting member comprises one or more side panels of fabric materials for the structure, and sleeves or tubes are formed or provided along peripheral parts of the panels for receiving the first and second loops thereby holding the first and second loops fixed relative or with respect to each other.

[0008] Alternatively, the connecting member comprises one or more detachable connectors.

[0009] Advantageously, the first and second loops can be of different shape. For example, the first loop is substantially circular and the second loop is substantially oval. Further, the first and second loops can also be of different size.

[0010] In practice, a bottom curved portion of the first and or second loop is shaped into a substantially straight bottom portion to provide a more stable stand-up frame for the structure for use.

[0011] In accordance with another aspect of the present invention, there is provided a self-supporting structure. The structure comprises first and second resilient loops intersecting with each other at two positions and connecting member for the loops. Each of the loops is self-expanding by virtue of its resilience and the loops are connected to expand in space into a self-standing expanded configuration for use.

[0012] More specifically, in the self-supporting structure, the connecting member is provided to limit the extent to which the loops expand in space into the self-standing expanded configuration for use, and the loops are capable of being pivoted to lie substantially flat with each other and then coiled into a plurality of much smaller turns into a collapsed configuration for storage. Preferably, the connecting member is provided in the form of flexible panel or panels extending across the loops for stretching to limit the extent to which the loops expand in space into the self-standing expanded configuration for use.

[0013] Conveniently, the first and second loops may be hinged together at the two positions at which they intersect with each other.

[0014] In practice, the first and second loops are held close together at the two positions at which they intersect with each other by means of peripheral parts of the panel or panels at the two positions. In one particular embodiment, sleeves are provided to extend along the peripheral parts of the panel or adjoining peripheries of the panels, and the first and second loops are held within the sleeves.

[0015] It is preferred that each loop has a central axis in the plane of the loop, and the two positions at which the loops intersect with each other are symmetrically on opposite sides of an imaginary vertical plane containing the central axes of the loops. More preferably, the central axis of each loop is an axis of symmetry for the loop.

[0016] In another embodiment, at least one of the loops has a substantially straight bottom portion for the structure to stand on a ground.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The invention will now be more particularly described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a front perspective view of a first embod-

iment of a self-supporting structure in accordance with the invention, said structure showing a stand-up frame formed by a first and a second loops;

Figure 2 is a perspective view showing a possible variation of the stand-up frame formation of Figure 1;

Figures 3A and 3B are perspective views, enlarged, showing different manners of connection of the first and second loops;

Figure 4 is a front perspective view of a second embodiment of a self-supporting structure in accordance with the invention, said structure being formed by a pair of intersecting resilient loops and flexible panels extending across them;

Figures 5A to 5F are perspective views showing possible variations of the loops of Figure 4;

Figures 6A to 6I are perspective views of a third embodiment of a self-supporting structure in accordance with the invention, showing how the structure is collapsed into a much smaller size; and

Figures 7 to 11 are perspective views of fourth to eighth embodiments of a self-supporting structure in accordance with the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] Referring initially to Figure 1 of the drawings, there is shown a first self-supporting self-standing structure 50, which comprises a first loop 51 and a second loop 52. The loops 51 and 52 are substantially planar in configuration and define respective first and second planes 61 and 62. The loops 51 and 52 are arranged in a cross configuration to form a stand-up frame 60 for the structure 50. In the stand-up frame formation, the loops 51 and 52 provide support for each other and the planes 61 and 62 intersect with each other.

[0019] The loops 51 and 52 are connected together and are fixed relative or with respect to each other by two side panels of fabric materials 82 and 81 located at the top and bottom of the structure 50 respectively. Peripheral parts of the panels 81 and 82 are formed by sleeves or tubes 91 and 92 for receiving the loops 51 and 52 thereby holding the loops fixed relative or with respect to each other. Alternatively, detachable connectors (not shown) may be used. The top and bottom panels 82 and 81 which are connecting member for loops 51 and 52, are flexible and the stand-up frame 60 may be collapsed into a stack of two loops which can further be coiled into a pack for storage and transportation.

[0020] In the structure of Figure 1, the loops 51 and 52 are bent into rectangular shape having straight top and bottom edges, and additional side panels 83, 84 and 85 are provided on the left, right and rear of the structure, leaving a front opening, which may be used as a goal for various sport games, such as soccer and hockey.

[0021] In the first structure 50, the loops 51 and 52

also intersect each other at respective first locations 55A and 56A and at respective second locations 55B and 56B on the loops. The first and second locations 55A and 55B/56A and 56B are positioned symmetrically on opposite sides of each loops 51/52.

[0022] Referring to Figure 2, the loops 51 and 52 are arranged in a cross configuration forming a stand-up frame 60 similar to the first structure of Figure 1. The first loop 51 is slightly smaller in size than the second loop 52. The two loops 51 and 52 are connected to each other and are fixed relative or with respect to each other at the two intersecting positions A and B by connecting pins or axles 57A and 57B. The connecting pins or axles allow the loops 51 and 52 to be freely pivotable in the direction towards each other into a stack of two loops which can further be re-coiled into a pack of smaller turns for storage and transportation.

[0023] Figures 3A and 3B illustrates different manners of connecting the loops 51 and 52. Preferably, the top and bottom panels 82 and 81 of the first structure of Figure 1 are extended to the intersecting positions A and B. The sleeves or tubes 91 and 92 are also extended and joined at the intersecting positions A and B. Figures 3A and 3B show the different ways in which the sleeves or tubes 91 and 92 may be joined and or sewed together at the intersecting position B on the right side of the structure. The loops 51 and 52 are received and held inside the sleeves or tubes 91 and 92 and are held close together at the intersecting position. In Figure 3A, the sleeves or tubes for receiving the first loop 51 are joined together separately from the sleeves or tubes for receiving the second loop 52, the respective sleeves or tubes forming a cross-over. In Figure 3B, the respective sleeves or tubes are joined together forming a 4-way junction.

[0024] Referring now to Figure 4 of the drawings, there is shown a second self-supporting structure 100 embodying the invention, which comprises first and second loops 110 and 120 intersecting with each other at two opposite positions A and B. The loops 110 and 120 are of similar shape and size and are formed by respective thin strips 130 of resilient and hence flexible material, such as metal. Each strip 130 is bent, without folding, to have opposite ends joint straight together, such that each loop 110/120 is self-expanding by virtue of its resilient nature. More specifically, each loop 110/120 is shaped to have a generally straight bottom portion 132 and a curved upper portion 134.

[0025] The positions A and B, at which the loops 110 and 120 intersect, are on the upper strip portions 134 and symmetrically on opposite sides of an imaginary vertical plane containing a central axis or axis of symmetry of and in the plane of each loop 110/120. At positions A and B, the loops 110 and 120 are hinged together by means of respective pins 136A and 136B.

[0026] The structure 100 also comprises connecting member for the loops 110 and 120. The connecting member is provided in the form of three flexible, fabric

panels 140, 150 and 160 which connect the loops 110 and 120 together and extend across them, on their bottom, rear and top sides respectively, for stretching to limit the extent to which the loops 110 and 120 expand in space into a self-standing expanded configuration for use. While the structure 100 is standing on the ground, with the straight portions 132 of the strips 130 lowermost for stability, the first loop 110 leans backward and the second loop 120 is inclined forward. Each panel 140/150/160 closes the respective side of structure 100 between the parts of the loops 110 and 120 on that side from the hinges 136A and 136B. There is an additional flexible, fabric panel 170 which extends across the loop 110 alone and is formed with a central rectangular opening 172 on the front side of the structure 100. The opening 172 serves as an entrance for the structure 100 to be used as a play hut or tent.

[0027] The panels 140, 150, 160 and 170 are sewed together along their adjoining peripheries in conjunction with a pair of separate loop-shaped fabric sleeves (not shown) which extend in the direction of the loops 110 and 120 along the panels' adjoining peripheries and the exposed front periphery of the top panel 160. The two sleeves are provided for holding the respective loops 110 and 120, thereby connecting the loops 110 and 120 and the panels 140, 150, 160 and 170 together. The loops 110 and 120 are held close together by means of peripheral parts of the panels.

[0028] During assembly, the panels 140, 150, 160 and 170 are sewed together with the two sleeves. The sleeves are left temporarily open at the two positions A and B, through which the two strips 130 are inserted into the sleeves and then joined end-to-end to form the respective loops 110 and 120. The loops 110 and 120 are subsequently hinged together by means of the pins 136A and 136B at positions A and B. Finally, the sleeves at positions A and B are sewed closed to complete the manufacture of the structure 100. It is appreciated that the pins 136A and 136B are optional since the top and bottom panels 160 and 140 connect and hold close together the loops 110 and 120.

[0029] The loops 110 and 120 are pivotable to lie substantially flat with each other, with slight deformation as necessitated by the presence of the panels 140, 150, 160 and 170. subsequently, the loops 110 and 120 are capable of being simultaneously coiled into a plurality of much smaller turns, usually three turns for each loop 110/120, into a collapsed configuration for storage. Upon release, the structure 100 self-expands for use.

[0030] Figures 5A to 5C show a pair of intersecting loops 10 and 20 similar to the aforesaid loops 110 and 120. The loops 10 and 20 may cross with each other at an intermediate position (Figure 5A) as in the case of the loops 110 and 120, or at an upper position (Figure 5B) or a lower position (Figure 5C). Further, the loops 10 and 20 may have different shapes and sizes (Figures 5D, 5E and 5F).

[0031] Referring now to Figures 6A to 6I of the

drawings, there is shown a third self-supporting structure 200 embodying the invention, which has a construction in principle similar to that of the second structure 100. The third structure 200 is formed by a pair of oval resilient loops 210 and 220 intersecting symmetrically with each other at two opposite positions X and Y. The structure 200 includes top and bottom flexible panels 260 and 240 and a pair of opposite side flexible panels 270 and 250, extending across the loops 210 and 220. The top panel 260 has a wide central opening 262, which enables the structure 200, upon expansion and standing horizontally, to act as a basket for toys.

[0032] As in the case of the second structure 100, the loops 210 and 220 are confined within sleeves co-extending with adjoining peripheries of the panels 240, 250, 260 and 270. However, the loops 210 and 220 are not directly hinged together at positions X and Y, but are held close together in a loose manner by reason of the parts of the sleeves there crossing with each other. Such an indirect connection is simpler in construction and allows the loops 210 and 220 to move more freely with respect to each other and to slide in their respective sleeves, thereby facilitating collapsing of the structure 200.

[0033] For collapsing the structure 200, the loops 210 and 220 are initially pivoted to lie flat with each other (Figure 6B), then squeezed to bring their opposite sides together (Figures 6C and 6D), and finally twisted and coiled into three much smaller turns (Figures 6E, 6F, 6G, 6H and 6I). Upon release, the structure 200 springs open automatically for use.

[0034] Figures 7 to 11 show fourth to eighth self-supporting structures 400, 500, 600, 700 and 800 embodying with the invention, which have a construction in principle similar to those of the first, second and third structures described above.

[0035] The fourth structure 400 is similar to the second structure 100, except having an opening 402 which is defined by upper and lower straight portions of the two loops. The fifth structure 500 is also similar to the second structure 100, except having an opening 502 which is defined by an upturned round portion of one of the two loops. The sixth structure 600 is similar to the third structure 200, except having an asymmetrical shape.

[0036] Referring to the seventh or eighth structure 700/800, the two loops intersect with each other at a relatively higher position to form a pyramid-like tent having an open top end. For the seventh structure 700, an entrance 702 is formed at a near-rectangular side by making the panel there centrally openable. For the eighth structure 800, a similar entrance 802 is formed at a triangular side.

[0037] The invention has been given by way of example only, illustrating the general principle of construction and the multiple applications for different purposes and uses. Various modifications of and/or alterations to the described embodiments may be made

by persons skilled in the art without departing from the scope of the invention as specified in the appended claims.

Claims

1. A self-supporting structure comprising first and second resilient loops intersecting with each other at two positions, each of said loops being self-expanding by virtue of its resilience, and connecting member for the loops, said loops being connected to expand in space into a self-standing expanded configuration for use. 10
2. A self-supporting structure as claimed in Claim 1, wherein the connecting member is provided to limit the extent to which the loops expand in space into the self-standing expanded configuration for use, and the loops are capable of being pivoted to lie substantially flat with each other and then coiled into a plurality of much smaller turns into a collapsed configuration for storage. 15
3. A self-supporting structure as claimed in Claim 2, wherein the connecting member is provided in the form of flexible panel or panels extending across the loops for stretching to limit the extent to which the loops expand in space into the self-standing expanded configuration for use. 20
4. A self-supporting structure as claimed in Claim 2, wherein the first and second loops are hinged together at the two positions at which they intersect with each other. 25
5. A self-supporting structure as claimed in Claim 3, wherein the first and second loops are held close together at the two positions at which they intersect with each other by means of peripheral parts of the panel or panels at the two positions. 30
6. A self-supporting structure as claimed in Claim 5, wherein sleeves are provided to extend along the peripheral parts of the panel or adjoining peripheries of the panels, and the first and second loops are held within the sleeves. 35
7. A self-supporting structure as claimed in any one of Claims 1 to 3, wherein each loop has a central axis in the plane of the loop, and the two positions at which the loops intersect with each other are symmetrically on opposite sides of an imaginary vertical plane containing the central axes of the loops. 40
8. A self-supporting structure as claimed in Claim 7, wherein the central axis of each loop is an axis of symmetry for the loop. 45
9. A self-supporting structure as claimed in any one of Claims 1 to 3, wherein at least one of the loops has a substantially straight bottom portion for the structure to stand on a ground. 50
10. A self-supporting self-standing structure, comprising a first loop, said first loop substantially defining a first plane, and a second loop, said second loop substantially defining a second plane, wherein the first and second loops are arranged in a cross configuration with the first and second planes intersecting each other and the first and second loops providing support for each other forming a stand-up frame for the structure. 55
11. A structure as in Claim 10, wherein the first and second loops are fixed relative or with respect to each other in the stand-up frame formation.
12. A structure as in Claim 10, wherein the first and second loops are connected to or intersect each other at respective first locations on the first and second loops in the stand-up frame formation.
13. A structure as in Claim 12, wherein the first and second loops are connected to or intersect each other at respective second locations on the first and second loops in the stand-up frame formation.
14. A structure as in Claim 13, wherein the first and second locations on each of the first and second loops are positioned symmetrically on opposite sides of each of the first and second loops.
15. A structure as in Claim 13, wherein the first and second locations on one of the first and second loops are positioned on an upper half portion of said one loop.
16. A structure as in Claim 10 or 14, wherein the first and second loops are connected to each other with connecting member which allows the stand-up frame to be collapsed into substantially a stack of loops, said stack of loops can be coiled into a pack.
17. A structure as in Claim 16, wherein the connecting member comprises one or more side panels of fabric materials for the structure.
18. A structure as in Claim 17, wherein sleeves are provided along peripheral parts of the panel or panels for receiving the first and second loops.
19. A structure as in Claim 16, wherein the connecting member comprises one or more detachable connectors.
20. A structure as in Claim 16, wherein the first and

second loops are of different shape.

21. A structure as in Claim 16, wherein the first loop is substantially circular and the second loop is substantially oval. 5
22. A structure as in Claim 16, wherein the first and second loops are of different size.
23. A structure as in Claim 16, wherein a bottom curved portion of the first or second loop is shaped into a substantially straight bottom portion. 10
24. A self supporting structure substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings. 15

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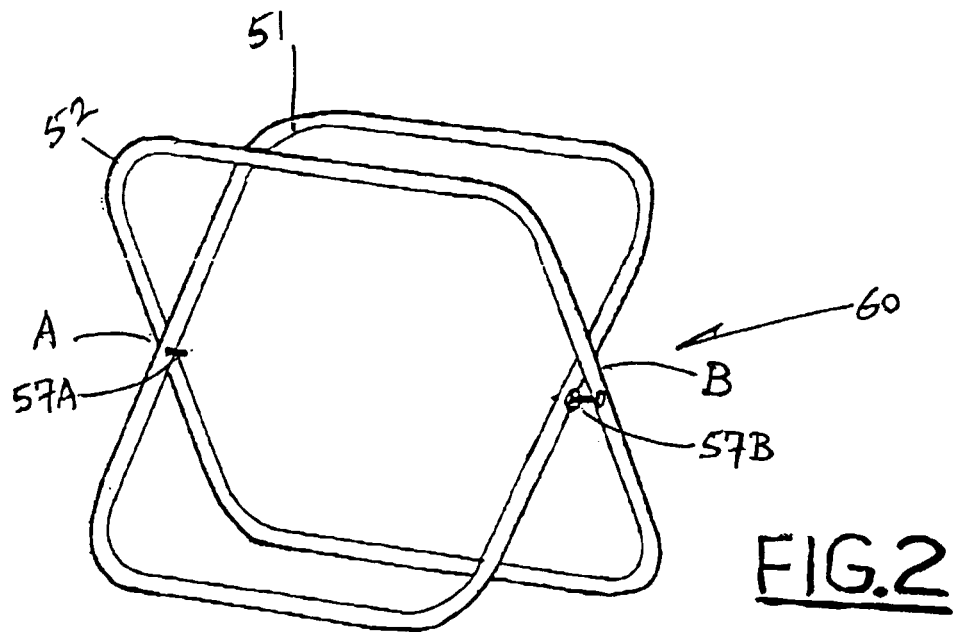
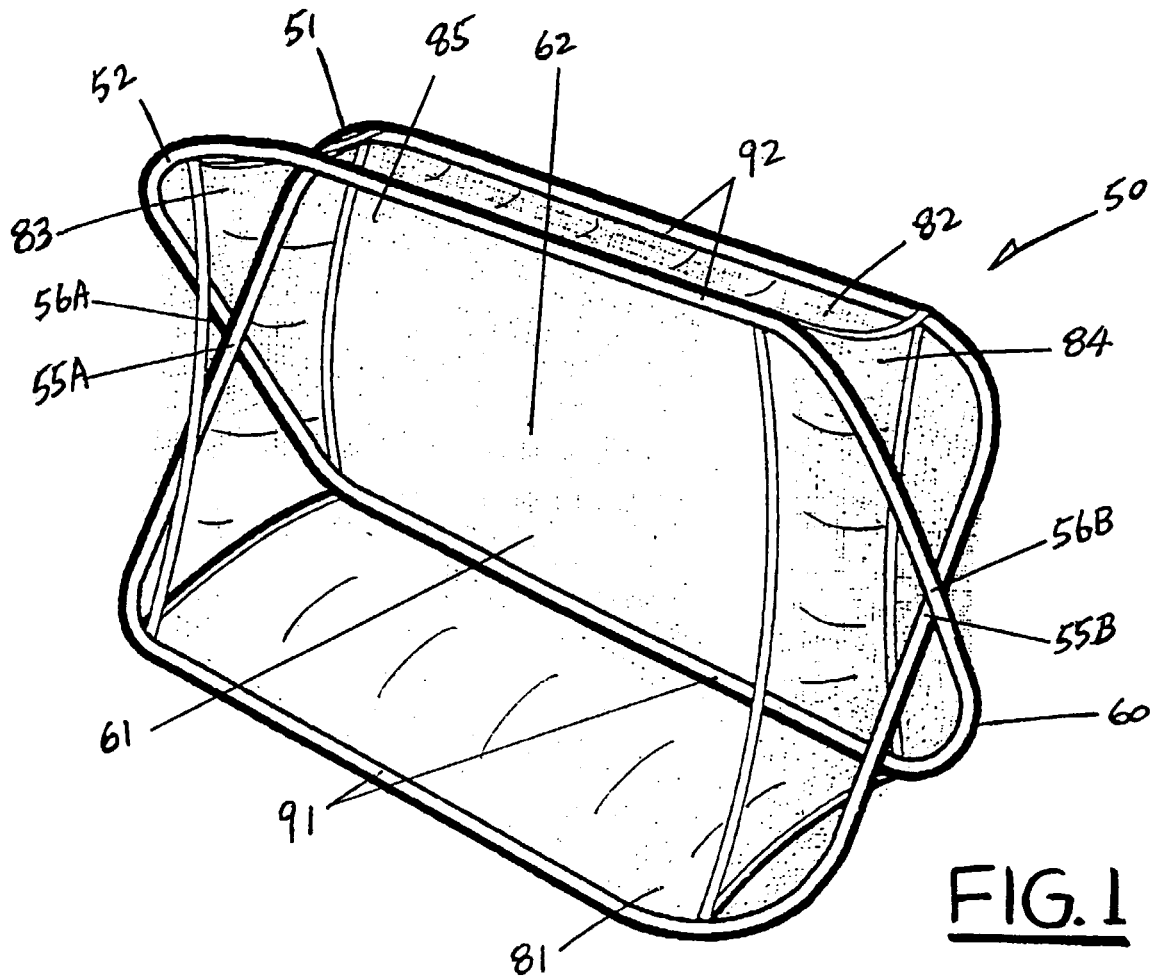
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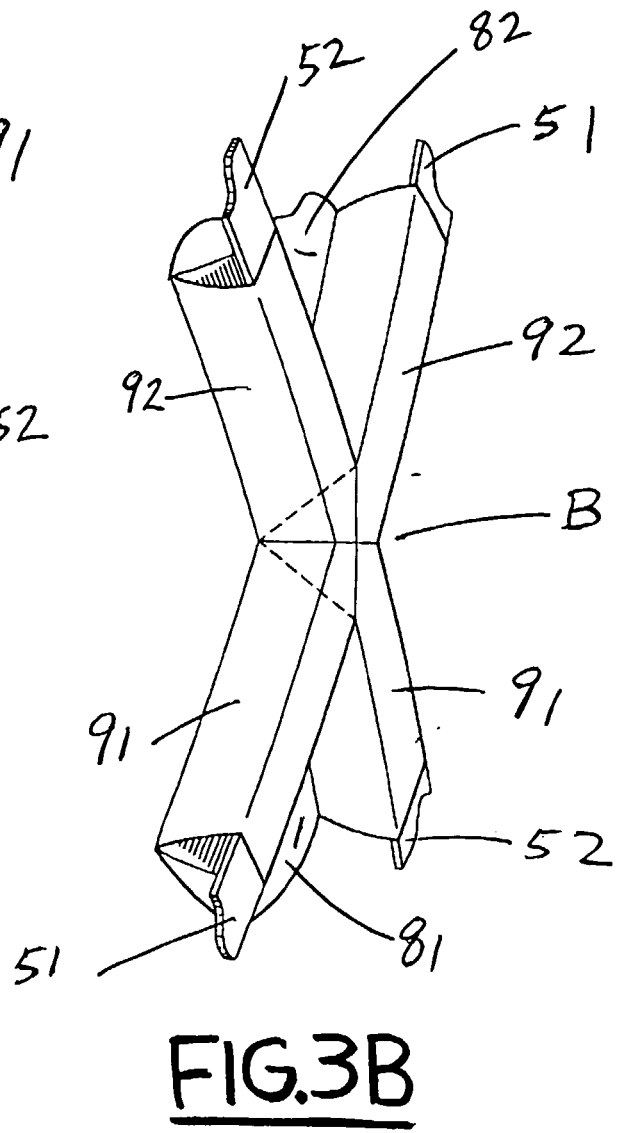
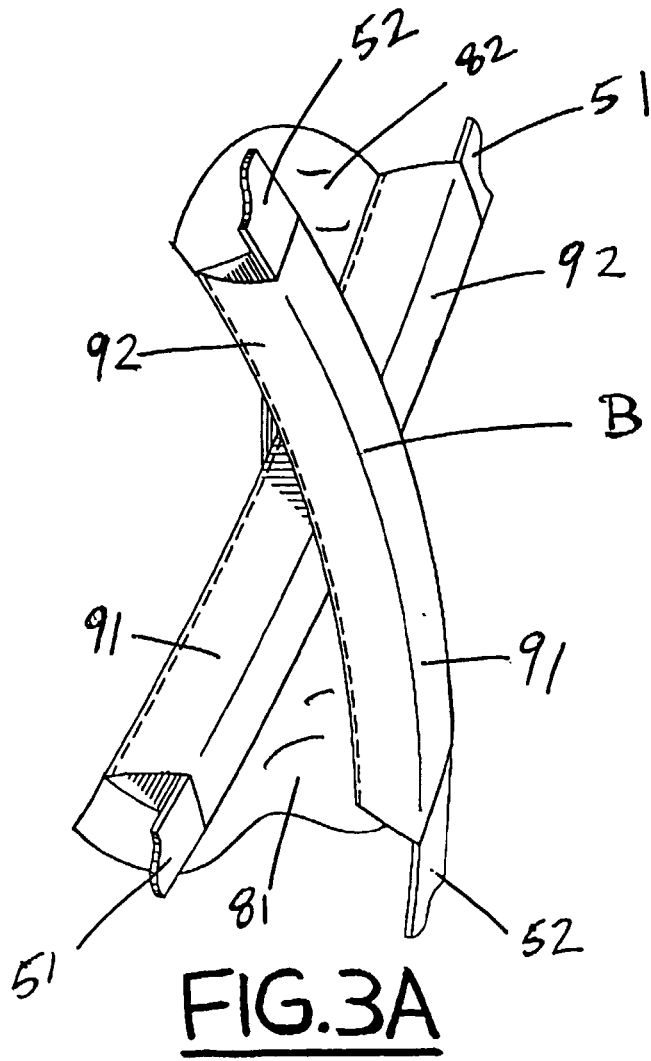
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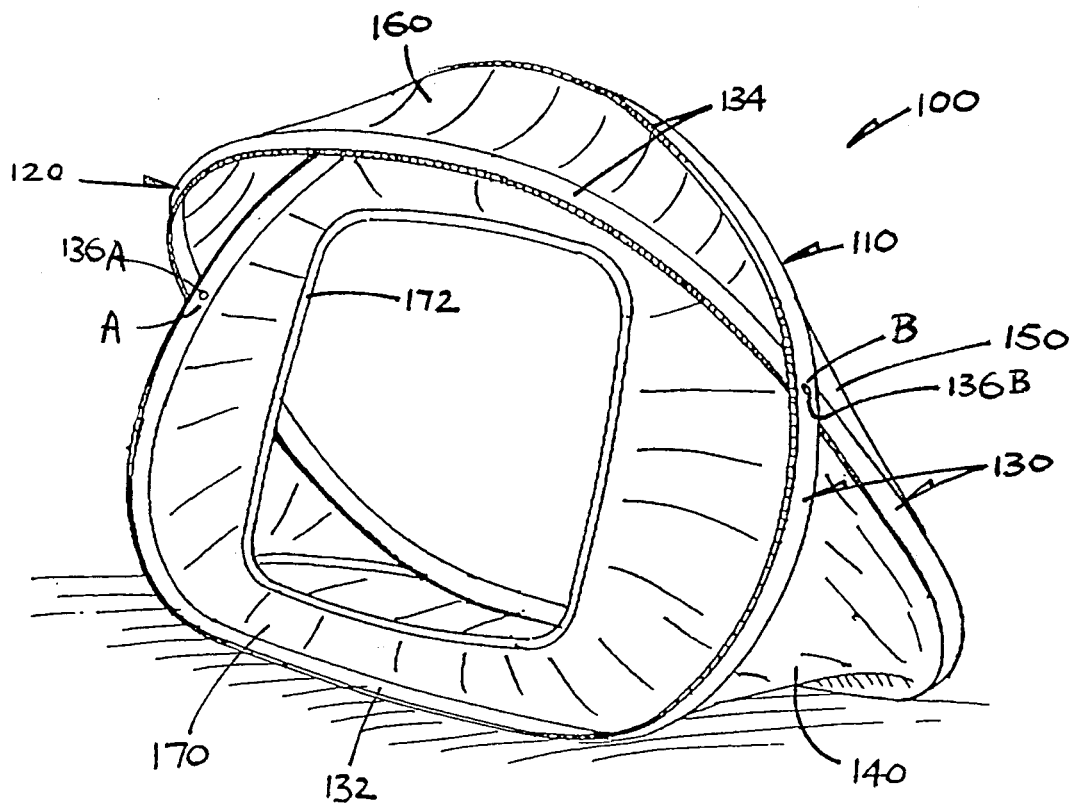


FIG. 4

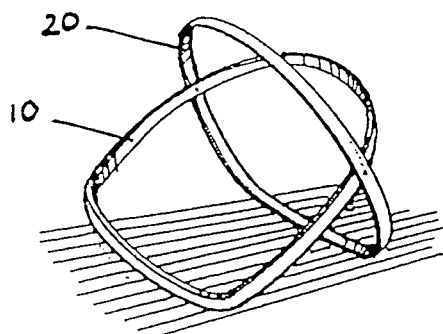


FIG. 5A

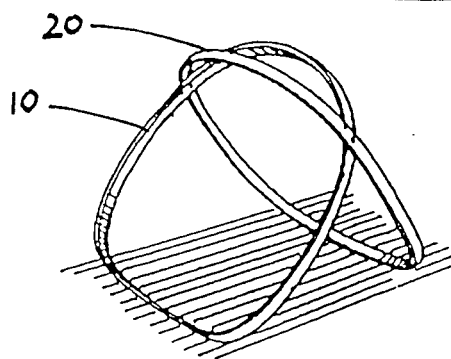


FIG. 5B

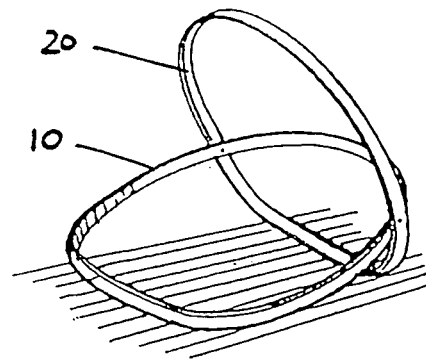


FIG. 5C

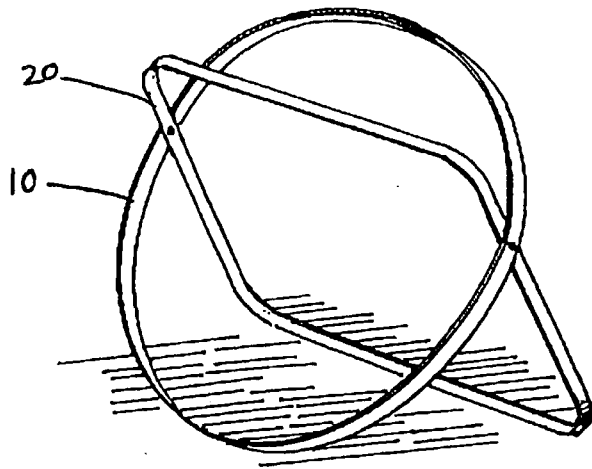


FIG. 5D

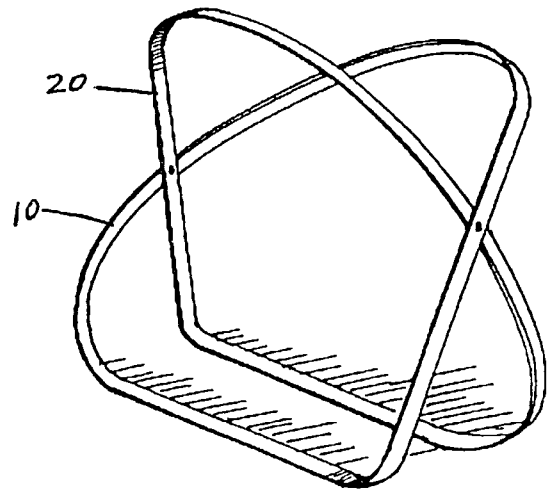


FIG. 5E

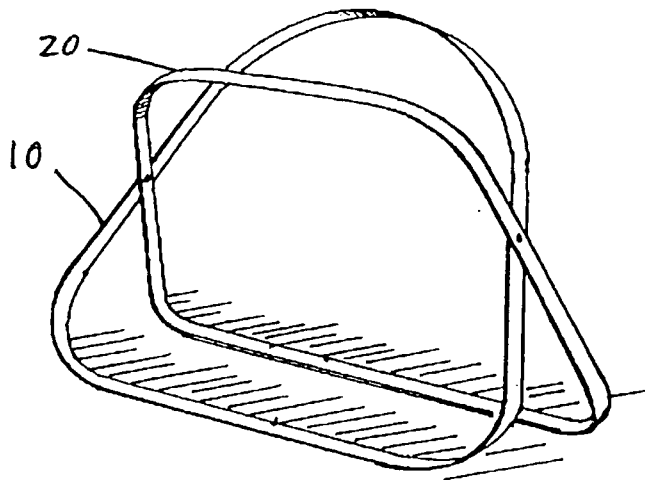


FIG. 5F

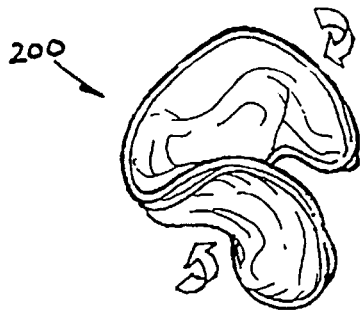


FIG. 6E

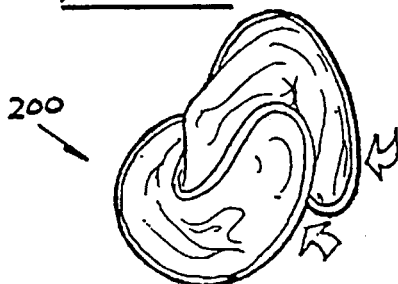


FIG. 6F



FIG. 6G

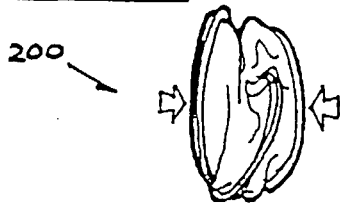


FIG. 6H

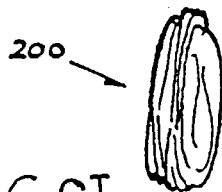


FIG. 6I

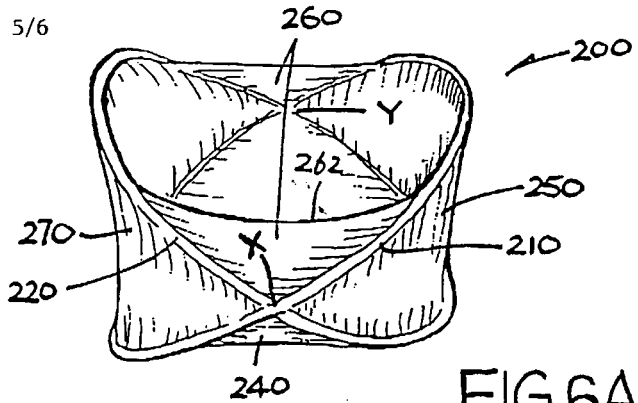


FIG. 6A

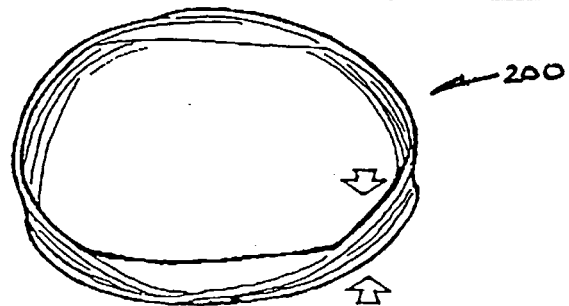


FIG. 6B

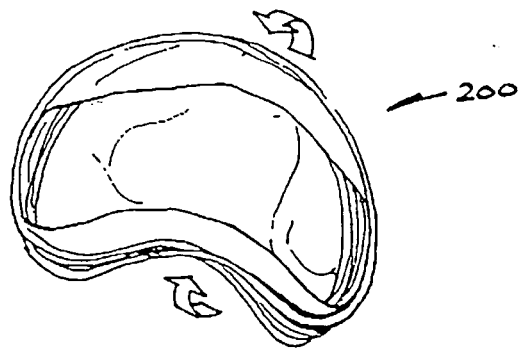


FIG. 6C

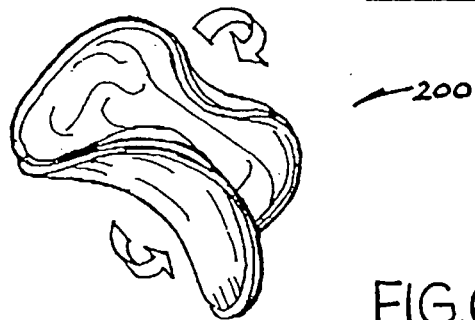


FIG. 6D

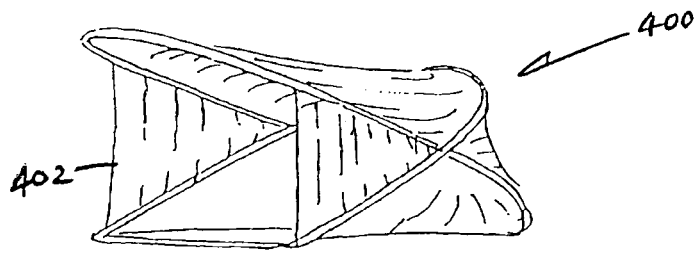


FIG. 7

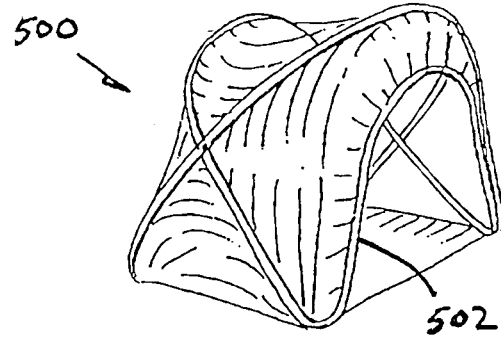


FIG. 8

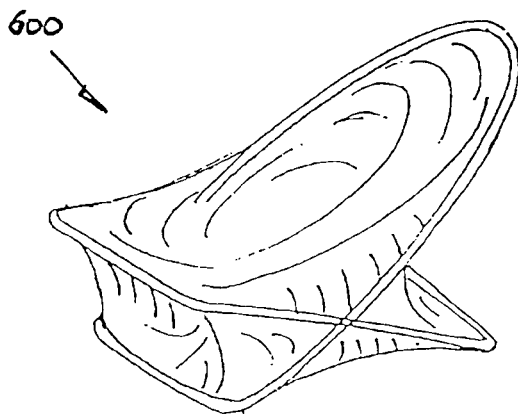


FIG. 9

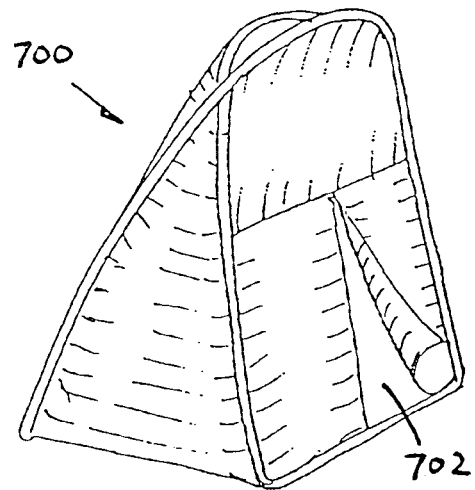


FIG. 10

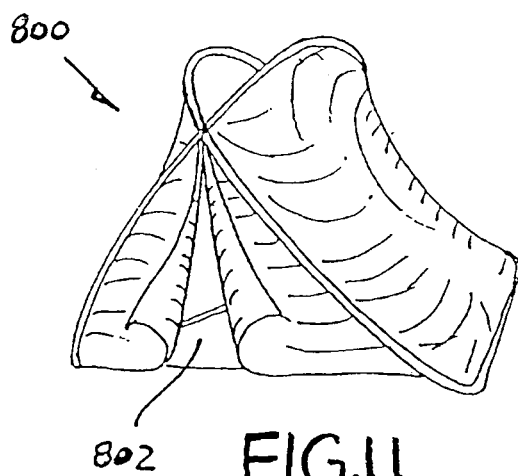


FIG. 11