SYSTEMS AND METHODS FOR PROVIDING AN INSULATED SLEEPING CHAMBER

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Appl. No.: 11/844,960

Filed: Aug. 24, 2007

ABSTRACT
A sleeping chamber uses a double-wall inflatable structure to provide insulation against cold temperatures using a non-rigid form constructed of a lightweight material such as a polyethylene film. The sleeping chamber is lighter in weight, smaller in bulk, and generally lower in cost than a conventional tent, while providing improved insulation against cold temperatures.
SYSTEMS AND METHODS FOR PROVIDING AN INSULATED SLEEPING CHAMBER

BACKGROUND OF THE INVENTION

1. Related Applications

This application claims priority to U.S. Provisional Patent Application Ser. No. 60/840,388 filed Aug. 25, 2006, entitled INSULATED SLEEPING CHAMBER, and to U.S. Provisional Patent Application Ser. No. 60/914,661 filed Apr. 27, 2007, entitled SYSTEMS AND METHODS FOR PROVIDING AN INSULATED SLEEPING CHAMBER, which are incorporated herein by reference.

2. Field of the Invention

The present invention relates to sleeping chambers. More particularly, embodiments of the present invention relate to a lightweight, non-rigid, easily portable sleeping chamber that provides insulation against low temperatures and other environmental dangers even in relatively extreme conditions.

3. Background and Related Art

Products currently exist that provide protection from the elements when sleeping outside of a dwelling, such as when camping or during emergencies (e.g., natural disasters or when stranded away from safe dwelling places). One example of such a product is a tent. Tents are available in a variety of shapes and sizes, with features suited to a variety of conditions. Tents include rigid structures to create a cavity within which a person may repose, generally within a sleeping bag to stay warm. While some tents rely on a set of flexible rigid poles to provide a pop-up design requiring limited assembly time, most tents require efforts such as staking corners of the tent into the ground, positioning tent poles, and so forth. Generally, those devices which are most convenient to use are also very expensive to produce and purchase.

Many situations arise, however, where tents are inadequate. These include situations where the bulk of a tent is inappropriate, where the weight of a tent is unacceptable, or where the cost of a tent is prohibitively high. Nevertheless, persons in such situations may require protection from the elements and the ability to sleep in comfort.

Thus, while techniques currently exist that are used to provide protection from the elements, challenges still exist. Accordingly, it would be an improvement in the art to augment or even replace current techniques with other techniques.

SUMMARY OF THE INVENTION

The present invention relates to sleeping chambers. More particularly, embodiments of the present invention relate to lightweight, non-rigid, highly portable sleeping chambers that provide insulation against low temperatures and other environmental dangers even in relatively extreme conditions.

Implementation of the present invention takes place in association with a sleeping chamber having a double-wall inflatable structure to provide insulation against cold temperatures using a non-rigid form constructed of a lightweight material such as a polyethylene film. The sleeping chamber is lighter in weight, smaller in bulk, and generally lower in cost than a conventional tent, while providing improved insulation against cold temperatures.

While the methods and processes of the present invention have proven to be particularly useful in the area of individual sleeping chambers, those skilled in the art can appreciate that the methods and processes can be used in a variety of different applications.

These and other features and advantages of the present invention will be set forth or will become more fully apparent in the description that follows and in the appended claims. The features and advantages may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. Furthermore, the features and advantages of the invention may be learned by the practice of the invention or will be obvious from the description, as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the manner in which the above-recited and other features and advantages of the present invention are obtained, a more particular description of the invention will be rendered by reference to specific embodiments thereof, which are illustrated in the appended drawings. Understanding that the drawings depict only typical embodiments of the present invention and are not, therefore, to be considered as limiting the scope of the invention, the present invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

FIG. 1 illustrates a representative embodiment of the present invention having a flexible arm;

FIG. 2 illustrates a cross-sectional view of the representative embodiment illustrated in FIG. 1;

FIG. 3 illustrates a top view of the representative embodiment of FIG. 1;

FIG. 4 illustrates a side view of the representative embodiment of FIG. 1;

FIG. 5 illustrates another embodiment of the present invention;

FIG. 6 illustrates another representative embodiment of the present invention;

FIG. 7 illustrates as side view of another representative embodiment of the present invention;

FIG. 8 illustrates a top view of another representative embodiment of the present invention;

FIG. 9 illustrates a side view of another representative embodiment of the present invention;

FIG. 10 illustrates a top view of another representative embodiment of the present invention;

FIG. 11 illustrates a side view of another representative embodiment of the present invention;

FIG. 12 illustrates a front view of another representative embodiment of the present invention;

FIG. 13 illustrates a top view of the representative embodiment of FIG. 12;
Fig. 14 illustrates a side view of the representative embodiment of Fig. 12;

Fig. 15 illustrates a front view of another representative embodiment of the present invention;

Fig. 16 illustrates a top view of the representative embodiment of Fig. 15; and

Fig. 17 illustrates a side view of the representative embodiment of Fig. 15.

Detailed Description of the Invention

The present invention relates to sleeping chambers. More particularly, embodiments of the present invention relate to lightweight, non-rigid, highly portable sleeping chambers that provide insulation against low temperatures and other environmental dangers even in relatively extreme conditions.

With reference to Fig. 1, a representative embodiment of the present invention is illustrated as substantially non-rigid structure 10 having at least one inflatable space 30 capable of retaining gas or air. In some embodiments, non-rigid structure 10 comprises an elongate tunnel 20 and a hood 50, wherein tunnel 20 is capable of substantially enclosing at least one occupant 5, and tunnel 20 is closed on one end 42 and open on the other end 44.

In some embodiments, two layers (illustrated as layers 26 and 28) that are not required to be constructed of the same material, are used to construct the top 22 of tunnel 20 and to cause tunnel 20 to retain a concave or tunnel-like shape when inflatable space 30 filled with a gas or air. The two layers 26, 28 are sealed or otherwise coupled together to create at least one inflatable space 30 capable of retaining a gas (e.g., ambient air, etc.), thus forming a dead air space when inflated.

In some embodiments, an inflation valve 46 provides access to inflatable space 30 so that a user can inflate space 30 by blowing air into valve 46, which may be positioned inside tunnel 20, outside tunnel 20, or otherwise, as will be apparent to those skilled in the art. In some embodiments, valve 46 is designed or otherwise intended for use with an accessory air pump. In some embodiments, tunnel 20 includes, whether integrated or as an accessory, containers of compressed gasses of various types capable of automatically inflating inflatable space 30.

When the inflatable space 30 is not inflated, the materials comprising tunnel 20 can be substantially flat, without a tunnel-like shape or form, and are capable of being folded, rolled, or otherwise greatly reduced in volume.

In some embodiments, layers 26 and 28 of material that form top 22 of tunnel 20 are spot welded at intermittent points 32 to create a quilting or waffle-like pattern that aids in holding the position of the two layers 26, 28 of material in relative positions to one another. By using a waffled design, top 22 of tunnel 20 retains an enhanced shape when inflated via inflatable space 30.

In some embodiments, tunnel 20 comprises a height of approximately two feet or twenty-four inches when inflated with a first dead air space formed by inflatable space 30 comprising approximately one to one-and-one-half inches between layers 26 and 28 of material comprising top 22 of tunnel 20. In some embodiments, a waffling of layers 26 and 28 comprises connected points (e.g., quilt points, weld points, etc.) 32, two layers 26, 28 of top 22 that are spaced approximately two inches from one another.

Tunnel 20 also comprises a bottom 24. Bottom 24 may comprise one or more layers of material that can be the same or may differ from the material used to construct top 22. In some embodiments, bottom 24 comprises two layers 34, 36 of material that may be sealed together to form a pocket 38, which may be separate from inflatable space 30. Such a pocket 30 formed in bottom 24 may comprise a large slit 41 at one end so as to permit the insertion of a mat 40, foam pad, or other material to act as an insulating material between a person lying in sleeping chamber 10 and the ground on which sleeping chamber 10 may be placed. In some embodiments, pocket 38 may comprise a complete seal at its perimeter, having a valve that permits inflation of the pocket 38 in a manner similar to or different from the method used to inflate inflatable space 30 in top 22. By inflating pocket 38, an additional dead air space may be provided to insulate the occupant 5 of sleeping chamber 10 from the ground and to provide additional comfort compared to lying on the ground alone.

In some embodiments, the structure and cut of the materials comprising tunnel 20 is such that when inflatable space 30 is inflated, the bottom 24 curves at its open end 44 in a generally upward or cupping shape 43 so as to prevent water from easily entering tunnel 20, thus aiding the comfort of occupant 5. In some embodiments, this cupping shape 43 may extend approximately four to five inches above the ground.

Tunnel 20 may be affixed to the surface on which it lays, such as the ground when camping, by means of one or more optional loops 63 affixed to the sides of tunnel 20 along its length. As one non-limiting example, stakes, as are known in the art, may be inserted through such loops 63 driven into the ground to retain the position of sleeping chamber 10 during sleep when winds or sloping terrain might otherwise cause undesired movement.

In some embodiments, sleeping chamber 10 further comprises a hood 50. Hood 50 is typically made of a material similar to that of the tunnel, having characteristics such as puncture resistance, tear resistance, and water resistance. The materials used for hood 50 may differ from those used for tunnel 20 according to the desired requirements and characteristics of sleeping chamber 10. For example, while a colored material may be used for tunnel 20, a transparent material may be used for hood 50. Or, a heavier grade material may be used for tunnel 20 to provide greater strength, while a lighter grade material may be used for hood 50 to provide lighter weight.

In some embodiments, hood 50 is attached to bottom 24; a portion of the material comprising hood 50 may be merely an extension of the material used to construct a portion of tunnel 20.

In some embodiments, a part of hood 50 may be constructed of at least two layers 52, 54, in the same manner as top 22 of tunnel 20, and sealed so as to create an inflatable space 56 capable of retaining a gas. By means of a valve 48 affixed adjacent to space 56, a user may inflate space 56 by
blowing into it, or by use of a pump, compressed gas device, or otherwise. Once space 56 is inflated, hood 50 may be rotated into place as shown in FIG. 1 over the open end 44 of tunnel 20 so as to enclose the open end 44 and provide substantially complete protection for occupant 5.

In some embodiments, hood 50 has a height of approximately thirty inches so as to provide a comfortable headspace for occupant 5. Smaller or larger spaces may also be created by adjusting the inflation of space 56 or by using differing amounts of materials to create hood 50.

Typically, the edge of hood 50 sits on or overlaps with the edge 60 of top 22 of tunnel 20. In some embodiments, hood 50 may be attached to tunnel 20 by any means known in the art, including by means of one or more Velcro®-style pads, a Ziploc®-style closure, by snaps, by hooks and eyelets, by zippers, or otherwise. In some embodiments, hood 50 does not form an airtight seal with top 22 of tunnel 20 because of the slightly differing contours of the two structures and because of the walling that can be used to construct inflatable space 30 and space 56, which can create a bumpy or irregular surface on either top 22 or hood 50. Accordingly, in at least some embodiments, sufficient air can flow between tunnel 20 and hood 50 so as to permit occupant 5 to breath comfortably. In other embodiments, a portion of hood 50 adjacent to space 56 includes an area of mesh material that directly permits air flow to occupant 5.

In some embodiments, tunnel 20 comprises two areas of dead air space: one between the two layers 26, 28 when inflatable space 30 is inflated, and a second dead air space 62 between the bottom side of top 22 of the tunnel and the top of occupant 5. These two areas of dead air space provide significant insulation against cold temperatures outside of sleeping chamber 10.

In some embodiments, occupant 5 places a sleeping bag 66 into sleeping chamber 10, with sleeping chamber 10 acting as a one-person tent. In other embodiments, occupant 5 lies in sleeping chamber 10 with only a blanket, with only the clothing he or she is wearing, or with no clothing, relying on the insulative properties of the dead air spaces just described as protection against the elements.

In some embodiments, tunnel 20 may be constructed with an internal sock or sleeve 90, which may be constructed of nylon or of any other suitable material. Such an internal sleeve 90 may be used as a holder for accessories comprising various grades of material used to provide sleeping chamber 10 with different overall levels of insulation or heat retention. For example, an occupant might select a lightweight insert for use on a warm night, but might select a much heavier insert for use on a bitterly cold night. In this manner, sleeping chamber 10 in combination with an internal sleeve 90 and a selection of additional insert materials may act as a sleeping bag, providing variable levels of insulation via both dead air space and traditional insulative materials such as down, polyfill, or otherwise. In some embodiments, sheet of material may be placed across the open end 44 of tunnel 20 where the sheet has a hole and operates as a gasket enclosing the head or head and shoulders of occupant 5, preventing excess air flow between dead air space 62 and the space around the head of occupant 5 within hood 50.

Sleeping chamber 10, including tunnel 20 and hood 50, may be constructed of any appropriate material as is known in the art. Typically, characteristics such as light weight, water resistance, wind resistance, low cost, tensile strength, resistance to air penetration, and puncture resistance are desired, though the selection of material based on these characteristics may vary based on the requirements of a particular use. For example, when used for emergency relief situations such as aiding the survival of earthquake victims in mountainous areas, a material of lower cost can be selected to permit the purchase of a larger number of sleeping chambers; conversely, a high performance use intended for outdoor enthusiasts might dictate the best combination of light weight and durability without regard to cost. In some embodiments, a plastic film sold under the brand name ForceFlex® is used to construct both the tunnel and the hood. In some embodiments, both tunnel 20 and hood 50 are constructed using a material having a thickness in the range of 1 mil to 4 mils. In some embodiments, various plastic films or metallic films are used, such as Mylar®, polyethylene, and/or others.

Sleeping chamber 10 may be used in any environment where insulation against cold temperatures is needed. Non-limiting examples of such uses include camping, hiking, snowmobiling, fishing, and hunting; emergency preparedness; search and rescue operations; natural disaster and similar aid situations; military applications, both purpose-built and emergency use; and otherwise.

In some embodiments, the non-rigid and lightweight nature of sleeping chamber 10 permit it to be manually folded or compressed into a very small volume. In some embodiments, the entire sleeping chamber comprises a weight of less than one pound.

While at least some descriptions provided herein relate to a sleeping chamber intended for a single individual, multiple structures and formats are encompassed within the invention.

In some embodiments, sleeping chamber 10 is constructed to a smaller size intended for a child; in some embodiments, a tunnel and hood are constructed to enclose two or more adults positioned side by side 70, as shown in FIG. 5. Those skilled in the art will appreciate that embodiments of the present invention embrace even larger sizes, including embodiments that are able to enclose more than two occupants.

In some embodiments, sleeping chamber 10 is constructed wholly in a tube-like formation, without a hood 50 (a "single bag embodiment"). In such an embodiment, open end 44 of tunnel 20 comprises a closing mechanism, such as, without limitation, Velcro®-style closure, drawstring, Ziploc®-style closure, snaps, zipper, or otherwise. In such an embodiment, at least one portion of the wall of tunnel 20 comprises a mesh or other breathable fabric intended to permit the passage of air into and out of the portion of tunnel 20 in which occupant 5 repose, in order to provide occupant 5 with a supply of fresh air.

In some embodiments such as the single bag embodiment, the closure mechanism extends along the top of tunnel 20 adjacent to the place where an occupant 5 would enter the sleeping chamber 10; the closure mechanism can also extend along the top and sides of tunnel 20, or along only the side of tunnel 20. When the closure mechanism extends along the side of tunnel 20, its length relative to the
length of tunnel 20 can be small or great depending on the intended use of sleeping chamber 10. For example, where sleeping chamber 10 is intended for use in a medical rescue environment or similar situation where occupant 5 would have difficulty entering a small opening in tunnel 20, a closure mechanism extending substantially the full length of tunnel 20 may be used.

[0056] In some embodiments, as shown in FIG. 6, multiple sleeping chambers may be arranged in a coordinated fashion, such as in a star or other configuration, with a multi-person hood 80 positioned over the open portion of multiple tunnels, so as to provide an insulated portion over substantially all of each individual’s body while also providing a shared space where multiple individuals may communicate while positioned within their individual tunnels.

[0057] The identified features, characteristics, functions, and advantages described herein are not to be limiting in any way. It is contemplated that one skilled in the art will recognize other apparent features and advantages of the various embodiments of the invention other than those specifically recited, described, or mentioned herein. Therefore, while an embodiment of the invention comprising a tunnel and hood is specifically described, such descriptions are provided with the intention of encompassing like-systems or like-devices or like-methods that may or may not be obvious to one having ordinary skill in the art. At least some embodiments of the present invention embrace a polymer material, such as a polyethylene or other polymer material.

[0058] With reference now to FIGS. 7-11, representative embodiments of the present invention are provided. In particular, FIG. 7 illustrates as side view of a representative embodiment of the present invention. In the illustrated embodiment of FIG. 7, the length of the sleeping chamber is approximately 6-7 feet long, 32 inches wide, and 24-30 inches high. However, those skilled in the art will appreciate that embodiments of the present invention embrace sleeping chambers that are smaller and/or larger than the illustrated embodiment. Moreover, embodiments of the present invention embrace a variety of sleeping chamber configurations.

[0059] FIG. 8 illustrates a top view of a representative embodiment of the present invention, FIG. 9 illustrates a side view of a representative embodiment of the present invention with Velcro® tipped snap downs, FIG. 10 illustrates a top view of a representative embodiment of the present invention, and FIG. 11 illustrates a side view of a representative embodiment of the present invention. Those skilled in the art will appreciate that while Velcro® tipped snap downs are included in the illustrated embodiment, other embodiments of the present invention embrace other types of closures, including tie downs, snaps, clips, etc.

[0060] At least some embodiments of the present invention embrace a sleeping chamber for outdoor backpackers, hunters, scouts, snowmobilers, emergency sleeping shelters, etc. that provides protection from inclement weather conditions, and at the same time, retain body heat, while providing insulation from cold weather. Some embodiments embrace having a light weight, low volume sock insert.

[0061] With reference now to FIGS. 12-14, another representative embodiment is illustrated. In particular, FIG. 12 illustrates a front or rear view of another representative embodiment of the present invention, FIG. 13 illustrates a top view of the representative embodiment of FIG. 12, and FIG. 14 illustrates a side view of the representative embodiment of FIG. 12. In the illustrated embodiment, the sleeping chamber can be selectively inflated, such as required by the weather.

[0062] The illustrated embodiment includes a high tensile strength plastic material. In some embodiments, there are multiple layers that are coupled together. Examples of coupling techniques include gluing, spot welding, bonding, and other coupling techniques. In at least some embodiments, the layers/materials are coupled in a “waffle” pattern. In one embodiment, the “waffling” pattern is in approximately a two-inch pattern that is seal welded around the perimeter. The waffling produces a “quilted” shell that, when inflated, produces a 1.5” to 2” dead air insulation barrier, for example. It also produces a dome shape that can rise at the middle, so as not to come in direct contact with the occupant. The floor includes a double layer of material. If not quilted, the plastic layers at the opening end of the chamber are open to allow the insertion of a ground pad, for example, for both comfort and insulation. When the end is quilted, it includes a separate way to inflate (e.g., via mouth, hand pump, or other technique).

[0063] In one embodiment, the dome portion covers the occupant inside, but the floor extends longer to provide a place where the occupant’s head can be located. In a stored position, the sleeping chamber can be rolled up into a compact position.

[0064] With reference now to FIGS. 15-17, another representative embodiment is illustrated. In particular, FIG. 15 illustrates a front or rear view of another representative embodiment of the present invention. FIG. 16 illustrates a top view of the representative embodiment of FIG. 15, and FIG. 17 illustrates a side view of the representative embodiment of FIG. 15. In the illustrated embodiment, the sleeping chamber can be selectively inflated, such as required by the weather. In some embodiments, the floor of the sleeping chamber is inflatable.

[0065] In the illustrated embodiment, the length of the sleeping chamber is approximately 6-7 feet long, and 5 feet wide. In some embodiments, the dome shape includes a height of 48 inches or more. In at least some embodiments, the need for any poles is eliminated. Further, flaps are provided for entering and/or exiting the sleeping chamber. The flaps are able to be independently inflated or deflated. Tie straps/mechanisms are provided for closure. Those skilled in the art will appreciate that while Velcro® tipped snap downs are included in the illustrated embodiment, other embodiments of the present invention embrace other types of closures, including tie downs, snaps, clips, etc. At least some embodiments embrace the use of stakes to be secured to the ground. In a storage position, the sleeping chamber can be placed into a compact area.

[0066] At least some embodiments include venting that allows airflow at the head, foot, seam and/or surface of a sleeping chamber. Moreover, those skilled in the art will appreciate that embodiments of the present invention embrace sleeping chambers that are smaller and/or larger than the illustrated embodiment. Moreover, embodiments of the present invention embrace a variety of sleeping chamber configurations.
Thus, as discussed herein, embodiments of the present invention embrace sleeping chambers. More particularly, embodiments of the present invention relates to a lightweight, non-rigid, highly portable sleeping chamber that provides insulation against low temperatures and other environmental dangers even in relatively extreme conditions.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. A sleeping chamber comprising:
   a first non-rigid portion having at least one inflatable portion capable of being filled with a gas to provide a first dead air space within said inflatable portion and a second dead air space between said inflatable portion and an occupant of said sleeping chamber.

2. The sleeping chamber of claim 1, further comprising a second non-rigid portion positioned above the first non-rigid portion, wherein the first non-rigid portion is non-hermetically attached to the second non-rigid portion along a substantial part of the perimeter of the first non-rigid portion, and wherein the second non-rigid portion is inflatable, and wherein the second non-rigid portion comprises multiple layers of a material that are joined to one another at intervals.

3. The sleeping chamber of claim 2, wherein the material comprises at least one of (i) polyethylene, (ii) Mylar, (iii) thermoplastic films, and (iv) metallic films.

4. The sleeping chamber of claim 2, wherein inflation of the second non-rigid portion creates a dead air space within the second non-rigid portion.

5. The sleeping chamber of claim 2, wherein inflation of the second non-rigid portion creates a dead air space between the first non-rigid portion and the second non-rigid portion.

6. The sleeping chamber of claim 5, wherein the dead air space is vented to an area not enclosed by either the first non-rigid portion or the second non-rigid portion.

7. The sleeping chamber of claim 5, wherein the dead air space is capable of enclosing at least one person.

8. The sleeping chamber of claim 2, wherein the second non-rigid portion is inflated with air.

9. The sleeping chamber of claim 2, further comprising a non-rigid inflatable hood hingedly attached to the first non-rigid portion.

10. A sleeping chamber comprising:
    a first portion; and
    a second portion positioned above the first portion, wherein the first portion is non-hermetically attached to the second portion along a substantial part of a perimeter of the first portion, and wherein the second portion is inflatable.

11. A sleeping chamber as recited in claim 10, further comprising:
    a hood that is non-hermetically attached to one end of the first portion, wherein the first portion, the second portion, and the hood each comprise a non-rigid, inflatable structure, and wherein when both the first portion and the second portion are inflated, a dead air space exists between the first portion and the second portion.

12. The sleeping chamber of claim 10, wherein the second portion comprises multiple layers of a material and the multiple layers are joined to one another at intervals.

13. The sleeping chamber of claim 12, wherein the material comprises at least one of (i) polyethylene, (ii) Mylar, (iii) thermoplastic films, and (iv) metallic films.

14. The sleeping chamber of claim 10, wherein the dead air space is vented to an area not enclosed by either the first portion or the second portion.

15. The sleeping chamber of claim 10, wherein the dead air space is capable of enclosing one person.

16. The sleeping chamber of claim 10, wherein the dead air space is capable of enclosing multiple persons.

17. A method of manufacturing a sleeping chamber comprising:
    providing a first non-rigid portion comprising multiple layers of a lightweight material wherein the multiple layers of the first portion are capable of retaining a gas;
    providing a second non-rigid portion comprising multiple layers of a lightweight material wherein the multiple layers of the second portion are capable of retaining a gas; and
    coupling the second non-rigid portion to the first non-rigid portion along a substantial part of the perimeter of the first non-rigid portion.

18. The method of claim 17, wherein the multiple layers of the second portion are joined to one another at intervals.

19. The method of claim 17, wherein said coupling comprises creating a structure such that when the multiple layers of the first non-rigid portion are filled with a gas and the multiple layers of the second non-rigid portion are filled with a gas, a space exists between the first non-rigid portion and the second non-rigid portion, said space being capable of enclosing at least one person.

20. The method of claim 19, wherein said space is vented to an area not enclosed by either the first non-rigid portion or the second non-rigid portion.

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