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Tent with non-pneumatic thermal envelope

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ABSTRACT

[0216] An improved version of one embodiment of a lightweight thermal insulation system comprising of an encompassing cover, made of a fabric, which is meaningfully airtight having a contiguous reflective material on the inward facing side thereof, surrounding an inner tent, comprising of a similar fabric and a frame. The two articles are brought together, whereby forming a meaningfully airtight space surrounding the entirety of the inner tent. The reflective material within the airtight space augments the air within said space into a thermal reservoir or thermal envelope, which is non-pneumatic having the capacity to effectively retard the movement of heat into and or out of said inner tent.

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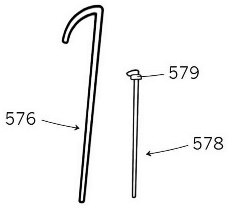


Fig.5

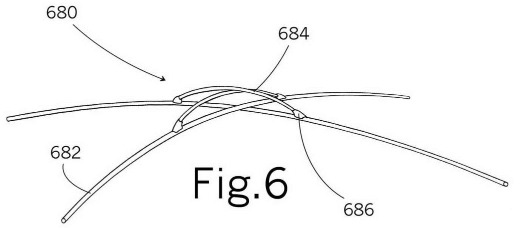


Fig.6

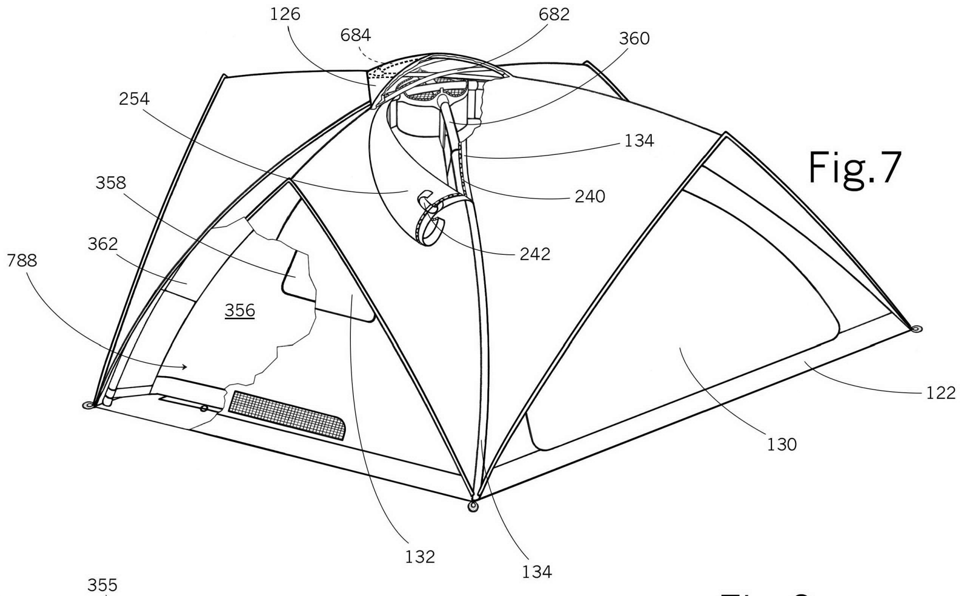


Fig.7

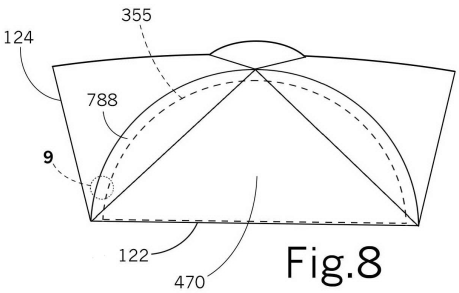
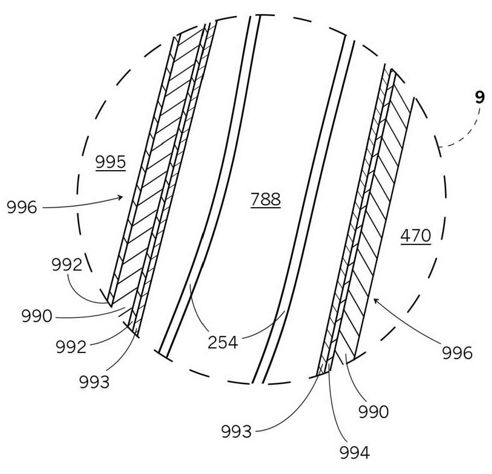


Fig.8

Fig.9



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Patent Application

of

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TITLE: TENT WITH NON-PNEUMATIC THERMAL ENVELOPE

CROSS REFERENCE TO RELATED APPLICATIONS Not Applicable

FEDERALLY SPONSORED RESEARCH Not Applicable

SEQUENCE LISTING OR PROGRAM Not Applicable

BACKGROUND - FIELD

[0001] This application relates to the field of tents, particularly to the improved thermal insulation of tents.

BACKGROUND – PRIOR ART

[0002] The insulation of tents at present is limited to those that are made of materials with inherent insulating properties. These are tents constructed from natural fibers such as cotton or hemp, known ubiquitously as canvas tents. Certain polymers such as polyvinyl chloride (PVC) or other heavy gauge synthetics used in the construction of larger or four season tents are also more insulating due to the thickness and imperviousness of the material. However, these tents are notoriously heavy and bulky, and not appropriate for most recreational purposes. Natural fibers are also slow to dry out after wet weather, making them prone to mildew if not stored properly. Despite their drawbacks, canvas tents are still in wide spread use among camping enthusiasts because of their natural insulating properties and general robustness.

[0003] However, it is the lightweight tents made from synthetic fabrics like nylon that dominate the market today. Both consumer favours them and manufacturer alike because they have greater flexibility in design, are easy and fast to set up and more cost effective. They are usually geodesic in shape and made of three elements; an inner tent comprising mesh paneling for fresh air with an integrated groundsheet to enclose said tent from the ground beneath, a frame to support said tent and a weather resistant cover known as a flysheet or rainfly. The rainfly is draped over and about the inner tent and secured near the ground. A standard rainfly is generally quite good at repelling the wind and the rain. However, the synthetic material has next to no inherent thermal properties against the cold of night or heat of the day.

[0004] Although nylon is by far the most commonly used synthetic material for the rainfly, it has a significant shortcoming. Although treated with waterproofing agents the material remains hydrophilic, making it predisposed to the absorption of water. Over time this leads to swelling, which in turn leads to sagging. This creates two problems. A sagging rainfly will eventually make contact with the inner tent and lead to moisture penetrating and pooling inside the tent. The other issue is that a sagging cover will flap about in the wind making it noisy and prone to damage. As such, the nylon fly requires repeated adjustment during wet weather. Polyester is a better alternative to nylon because it is naturally hydrophobic and will maintain its shape much better been saturated. Lightweight polyester fabrics are beginning to be adopted by the tent industry and its use in the present embodiment is important and will become apparent through a consideration of the detailed description.

[0005] Ultra lightweight tents or adventure tents, which is a relatively new market aimed at more extreme traveling and expedition, has emerged from a mixture of demand and technology. These tents are often made with advanced nylon or polyester materials with additional tear resistant weaves known as ripstop weaves. This enables the manufacturers to use lighter fabrics that can handle a range of conditions, some of which weigh as little as 18 grams (0.66oz) per square meter. Despite the innovation seen in this industry, a solution to improving the thermal properties of ultra lightweight tents has yet to emerge.

[0006] In addition to the lack of thermal insulation, lightweight and ultra lightweight tents used for hiking are typically designed with a low profile to combat strong winds, making them just large enough to sit in or sometimes just sleep in. Although compact and lightweight, sleeping within these compact spaces cannot stop radiate heat losses. Sealing the tent up to stop convective heat losses from intruding winds works temporarily until internal air temperatures drop via other means. On cold nights and particularly cloudless nights, an additional problem arises. Without cloud cover, radiant heat escapes into the upper atmosphere rapidly after nightfall and the difference in pressure between the warmer interior and the rapidly cooling exterior, can condense the warm moist air on the interior surface of the inner tent walls rather than the underside of the rainfly. The result can be very uncomfortable. One typically wakes up in the morning or worse during the night, to find their sleeping bag is damp and sticky. At rest this increases the experience of cold and being damp or wet in cold conditions can lead to hypothermia. It also necessitates the airing out of clothes and sleeping apparel each day to prevent the growth of fungi and bacteria. With a combination of insulation and adequate ventilation however, this problem can be resolved.

[0007] A recent example of a tent designed to address the poor thermal properties of modern synthetic tents is the Thermo tent manufactured in Co Kerry, Ireland by a company of the same name. The tent utilizes a cotton and polyester infill woven between nylon walls for insulation. Despite its appearance, it is not a lightweight tent. The insulation adds considerable mass to the overall weight of the tent. A three-person tent for example weighs 12kg and a six-person tent weighs almost 50kg. Compare that to a ten-person tent manufactured by the popular Australian brand Oztrail, which weighs only 17kg. Again, this design is not versatile enough for most recreational uses and certainly not suitable for hiking or the like. Though, like all synthetic fiber tents, the Thermo tent has the advantage of drying out faster after wet weather, which makes packing up quicker and easier.

[0008] Additionally, the Thermo tent design does not incorporate a rainfly to repel the wind and rain. This is potentially a problem. If the outer membrane of the tent was breached during foul weather (such as wind driven rain) and the infill became wet, thermal bridging would result. These 'dead spots' in the walls where the infill has become saturated, would create areas that have a significantly higher heat transfer rate than the surrounding material, resulting in an overall reduction in the thermal insulation of the entire tent. In other words, these wet areas allow heat to easily escape through to the colder outdoor environment.

[0009] Ideally, the thermal insulation of lightweight synthetic tents will be achieved by both thermal efficiency and weight efficiency. This is one of objectives of the present embodiment. There have been several approaches proposed to address the insulation of tents, which can be divided into two general categories. The first is using reflective materials to modify the internal temperature and the second approach utilizes pneumatic means of insulation.

[0010] Prior tents utilizing reflective materials do not adequately meet the foregoing criteria. Such as the 'solar tent' shown in U.S. Pat. No. 5582197 to Dobberstein and "Article of tent or shelter type" shown in PCT No. FR2012/051332 (U.S. Pub. No. 20140190540 A1) to Herpin and Michalak. The Dobberstein tent proposes a multi season, reversible tent that utilizes insulating infill, reflective materials and colours to adjust to changing weather conditions. The Dobberstein tent has a complicated reversing mechanism with limited applicability to prevailing day to night temperature differences experienced at most times of the year, whereby the tent would need to be adjusted in the evening to prevent heat loss at night and then reversed again in the morning to repel the heat of the day. Though Dobberstein proposes broader design possibilities apart from the preferred embodiment, that of a small triangular design, larger designs pose greater problems regarding reversibility. As the tent gets larger, so too does the reversing mechanism in order to withdraw the larger and heavier fabric panels. It also seems a rather inconvenient way of regulating internal temperatures. It is one of the objectives of the present embodiment to simplify the insulation problem whilst maintaining broad applicability.

[0011] The Herpin and Michalak tent proposes tent materials with either a metallised film layer or fabric impregnated with pigments containing titanium dioxide or aluminium powder, whereby infrared radiation is reflected back into the atmosphere to keep occupants cool during the heat of the day. Unfortunately, it seems that impregnated materials such as these were known prior to the Herpin and Michalak publication and it is thought by the inventor that the use thereof was discontinued in tents due to durability issues. This is a similar concept to the use of metallic polyurethane coatings that are seen in some tents today. The Herpin and Michalak tent further cannot adequately prevent thermal losses from within the tent during cold weather, such as at night, and make no mention of airtightness, without which any insulating properties any of the proposed materials might have had are virtually lost. Additionally, campers primarily use their tents to sleep or rest in and are active and away from their tents during the warmer part of the day. It seems logical therefore to address the thermal problems faced after nightfall, when its occupants are in the greatest need of shelter and a good rest.

[0012] The other major method devised for insulation is through pneumatic walls and floors, whereby the air trapped inside pressurised structures slows conductive losses. Two good examples are seen in U.S. Pat. No 4607655 to Wagner and Bixler and U.S. Pat. No. 2819724 to Barker. These designs have several significant drawbacks however. As a 'survival shelter' the Wagner and Bixler shelter, like all pneumatic designs, suffers from the threat of puncture. This alone renders it somewhat unreliable, particular if one were to depend on it for their survival. To their credit, the design can accommodate a puncture to one side of the shelter and still remain erect. However if the design were dependant on the punctured wall for insulation the tents effectiveness would still be compromised. The

Wagner and Bixler shelter is also limited in its scope. The alternate embodiment suggested by Wagner and Bixler, that of an inflatable transportation device for injured persons, rather than a shelter per say, seems a more appropriate use for their invention.

[0013] The Barker 'inflatable tent' has pneumatic walls, floors and doors. Its application is for Artic expeditions although other embodiments are suggested. It is a bulky design intended for longer usages and emergency situations. As with all pneumatic tents it suffers from similar drawbacks.

[0014] First, in order to be airtight, self-supporting and durable enough to walk on, the material used needs to be of a heavy gauge. Structures such as this are also commonly treated with a polyurethane sealant to achieve airtightness and polyurethane alone has some durability issues. It has a low threshold for being crushed repeatedly and must be folded carefully to prevent fracturing. Being folded for long periods is also problematic. The inside of the pneumatic structure is also filled with hundreds or possibly thousands of cross-threads attached between the inner and outer portions of the walls, floor and ceiling. This gives the tent great rigidity and stability but adds even more weight to the invention.

[0015] The pneumatic floor is perhaps the most susceptible part of the tent to puncture but the Barker tent is less likely to encounter problems in Artic regions. Barker does briefly discuss expanded utility of the tent design. However, the pressure and materials needed to form pneumatic self-supporting structures such as the Barker tent are impractical for almost all other campers. Of slight relevance in this regard is U.S. Pat. No. 5660197, U.S. Pat. No. 4876829 and U.S. Pat. No. 4384435, all of which utilize pneumatic construction in some form or another.

[0016] The Barker tent also utilizes reflective material on the inside of the tent walls to capture radiant heat from the stove therein. Like the Dobberstein tent, having reflective material on the inside on the tent walls can create visual discomfort, especially in the case of the Barker tent, considering the glare that is experienced in Artic Regions. It is also a significant fire hazard.

[0017] Accordingly, there is a need for a tent that can overcome the aforementioned limitations and be truly insulating under a variety of environmental conditions, whilst remaining lightweight and durable. Thus several advantages of one or more aspects are to provide an embodiment of a four-season tent capable of enduring various terrain and or extreme conditions. Other advantages of one or more aspects are to provide a tent that is easy to manufacture, setup, maintain, having insulation that is unaffected by moisture accumulation and able to adequately remove condensation from a tent interior. These and other advantages of one or more aspects will become apparent from a consideration of the ensuing description and accompanying drawings.

SUMMARY

[0018] An improved version of one embodiment of a lightweight thermal insulation system comprising of an encompassing cover, made of a fabric, which is meaningfully airtight having a contiguous reflective material on the inward facing side thereof, surrounding an inner tent, comprising of a similar fabric and a frame. The two articles are brought together, whereby forming a meaningfully airtight space surrounding the entirety of the inner tent. The reflective material within the airtight space augments the air within said space into a thermal reservoir or thermal envelope, which is non-pneumatic having the capacity to effectively retard the movement of heat into and or out of said inner tent.

BRIEF DESCRIPTION OF DRAWINGS

Fig.1 is a perspective view of a first embodiment.

Fig. 2 is a perspective view of a fly jacket strewn open upon the ground.

Fig. 3 is a perspective view of an inner tent.

Fig. 4 is a perspective view of the inner tent atop the open fly jacket.

Fig. 5 is an enlarged view of two pegs.

Fig. 6 is a perspective view of a rain hood and pole array.

Fig. 7 is a cut away perspective view of the first embodiment.

Fig. 8 is a simplified sectional side view of the first embodiment.

Fig. 9 is a sectional view of the thermal envelope.

Fig. 10a-d is a series of views of the upper external ventilation door

Fig. 10e is a perspective view of an upper air vent

Fig. 11a & b is a cut away perspective view and a perspective view of a lower air vent

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Fig. 12a is a perspective view of a second embodiment

Fig. 12b is a cut away perspective view of the second embodiment

Fig. 13 is an enlarged view of a pole access in the opened position

DRAWING – LIST OF REFERENCE NUMERALS

120. Fly jacket
122. Reinforced base
123. Fly jacket walls
124. Awning
126. Rain hood
128. Skylight
129. Rain gutter
130. Outer door
132. Outer window
134. Fastener guard
136. Fly jacket-securing point
138. Lower air vent
240. Airtight fastener
242. Hook and loop pole ties
244. Crease
246. Alignment square
248. Peg holes
250. Upper vent opening

252. Lower vent opening
253. Outer transparent window
254. Reflective film
355. Inner tent (first embodiment)
356. Inner wall
357. Inner door
358. Inner window
360. Tent pole
362. Threaded fabric bracing
364. Bracing
366. Inner tent base
367. Inner tent securing point
368. Upper vent
369. Upper vent brim
470. Tent interior
472. Mesh door
473. Standard zipper
474. Mesh window
475. Inner transparent window
576. Large tent peg
578. Small tent peg
579. Rubber gasket
680. Awning and rain hood pole array
682. Awning pole
684. Rain hood pole
686. Awning coupling
788. Thermal envelope

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9. Figure 9 cross sectional indicator

990. Polyester fabric

992. Silicone membrane

993. Vaporised metal

994. Hydrophilic membrane

995. External environment

996. Black body

1098. External upper ventilation door

1000. Mesh screen

1002. Plastic tie

1004. Tying loop

1006. Small piece of fabric

1008. Upper ventilation interior

1010. Internal upper ventilation door

1012. Circular zipper

1013. Internal vent tie and loop mechanism

1014. Heat shield

1016. Inner tent seam

1018. Seam sealer and or seam tape

1120. Internal lower vent door

1122. External lower vent door

1124. Lower ventilation interior

1126. Lower air vent fastener

1128. Curved airtight zipper

1130. Mesh screen

1132. Outer airtight zipper

1234. Vestibule

1236. Vestibule door
1238. Vestibule sidewall
1239. Vestibule weatherproofed edging
1240. Reinforced base; side section of
1242. External tent walls
1244. Pole access
1246. Securing point
1248. Rain hood of second embodiment
1250. Skylight of second embodiment
1252. External roof
1254. Vestibule pole
1256. External air vent of second embodiment
1258. External door
1260. Internal door
1261. Inner tent (second embodiment)
1262. Tent interior of second embodiment
1264. Module pole
1266. Pole sleeve
1268. Internal wall
1270. Internal reinforced base; side section of
1272. Reinforced base; under surface of
1274. Thermal envelope of second embodiment
1376. Steel pin
1378. Air tight fastener of pole access
1380. Pole access fastener protector

FOREWARD

[0019] The following disclosure is structured in a clear and progressive manner that fully describes two versions of the proposed embodiment comprehensively enough to enable someone, skilled in the art to which it pertains, to be able to make and use the same, and sets forth the best mode contemplated by the inventor for carrying it out.

DETAILED DESCRIPTION OF FIRST EMBODIMENT

DESCRIPTION OF FIGURE 1

A. Description of Figure 1

[0020] Fig.1 is a perspective view of one version of a small thermally insulated tent in accordance with the first embodiment comprising, an airtight weatherproof cover or fly jacket 120 with an integrated footprint groundsheet or reinforced base 122. The fly jacket 120 has a series of openings to permit egress, air and light into the tent. These openings form part of a plurality of walls 123, which are shaded by an awning 124 that together form an assembled embodiment of the fly jacket 120. Atop the awning 124 is shown a rain hood 126 with a skylight 128 integrated within its center. Along the periphery of the awnings 124 is seen a system of tiny fabric channels or rain gutters 129. An outer door 130 is shown located on one of said walls 123, as is an outer window 132. A long strip of weatherproof fabric with hook and loop joining means or fastener guard 134 is shown at the corners of the fly jacket 120. A securing point 136 is found at the four corners of the base 122 and a lower air vent 138 is visible beneath the window 132.

B. Brief description of the operation of the fly jacket 120

[0021] The fly jacket 120, as the name implies, is not a regular rainfly. The word jacket denotes both cover and insulation. In order to fully understand the operation of the fly jacket 120 and its associated components, it is necessary to first explore the other drawings. Suffice it to say for now that the fly jacket 120 operates as the outer most section of an insulation system, designed with features to accommodate various environmental conditions.

[0022] The large awnings 124 function as simple yet highly effective shading members and in conjunction with the rain gutters 129, channel rainwater away from the first embodiment, terminating at the bottom corners thereof. During heavy rain, motes need only be dug at said corners to direct pooling water away from the base 122, rather than about the entire perimeter. Snow is likewise channeled to said corners, whereby maintaining the stability of the first embodiment and removing snow obstructions to the outer door 130. This and other features will be discussed in depth in the descriptions that follow.

C. Contemplated materials for the fly jacket 120

[0023] The fly jacket 120 is composed of several elements. Firstly, the awnings 124 are contemplated to comprise of a 40-denier, high tenacity (n-66) ripstop polyester, impregnated with a weatherproofing urethane silicone agent on both sides thereof. This type of material is known by those skilled in the art as Silpoly and is particularly waterproof, lightweight and strong. It is available from Ripstop by the Roll in Durham, New Carolina USA.

[0024] However many other materials could be used such as polyethylene naphthalate (PEN), polyamide (nylon), polyethylene, polyurethane, etc. Natural fibers such as silk, jute, cotton or hemp, blends of natural and synthetic fibers or any number of non-woven materials such as CTF3 (Cuben fiber), polypropylene, polyimide, polyolefin etc. could also be used.

[0025] Other waterproofing agents would also suffice such as fluoro-silicone acrylate latex etc. Additives to the waterproofing agent are recommended, especially for the first embodiments awnings 124, such as polyether or polycarbonate etc.

[0026] Please note: the term polyester is reserved for polyethylene terephthalate (PET) when processed as a fiber. PET is used for many soft drink bottles and it is becoming increasingly common to recycle them after use by remelting the PET and extruding it as fiber. Using recycled PET saves valuable petroleum raw materials, reduces energy consumption, and eliminates solid waste sent to landfills.

D. Fly jacket 120 divisions

[0027] The fly jacket walls 123 are contemplated as comprising of an inferior section, visible in Fig.1 and a superior section (not shown) hidden beneath the awnings 124, whereby said superior section occupies approximately one third of the surface area of said walls 123. The two sections are contemplated as comprising different materials and the horizontal division of the wall 123 is contiguous to the topside of both the door 130 and window 132. It is further contemplated that said wall 123 sections are visually undifferentiated.

E. Brief description of the operation of the walls 124

[0028] The purpose for the division is contemplated as a passive cross ventilation system as means for diffusing condensation beneath said walls 123, whereby said superior section has a much higher moisture vapour transmission rate (MVTR) than said inferior section. The superior sections of the fly jacket walls 123 only need to be mildly waterproof because the awnings 124 shelter it. The unsheltered inferior section however is highly waterproof but more vapour impervious. The entire wall 123 remains meaningfully airtight; such that wind cannot penetrate it nor the air trapped beneath easily escape.

F. Contemplated materials for the wall 124 sections

[0029] For the inferior section, I contemplate the same material suggested for said awnings 124. This section requires good water repellency and wind resistance with the ability to withstand wind driven rain. For the superior section, I presently contemplate at least three alternative materials:

[0030] The first is an uncalendered 20 - 40-denier high tenacity ripstop nylon, with a hydrophilic polyurethane membrane on the outer facing side thereof. This arrangement performs best in cold weather conditions, particularly temperatures hovering around 0° Celsius.

[0031] The second proposed material for the superior section of said walls 123 is a fabric comprising, a tight duplex weave construction having an outer shell coated with a durable water repellent (DWR) finish to the outside thereof. These kinds of materials known by those skilled in the art as Pertex or Nikwax and are the registered trademarks of Mitsui & Co., Ltd, Japan and Paramo in East Sussex, UK, respectively. These materials defuse liquid water and water vapour via capillary action and works well in both cold and warmer, more humid conditions.

[0032] The third comparable multi layered material comprises of, an expanded polytetrafluoroethylene (ePTFE) micropourous layer having an outer nylon or polyester shell coated with a durable water repellent finish to the outside thereof. This multi-layered material is sold under the trademarks Toddtex and Tegraltex.

[0033] Another fabric that was recently released by Rab in the UK, similar to some of the fabrics used by the well-known Polartec brand, is called Flashpoint. It utilizes an outer shell comprising a 7-denier fabric with a fleecy finish and a contiguous polyurethane membrane underneath. It has superior breathability (>40,000g/m2/24h), nearly twice that of its multilayered competitors and is highly water resistant and lightweight. However, it is contemplated as being more suitable for warmer and or humid climates, whereby the extreme breathability can be utilized in conjunction with a heat porous fabric shell to remove excess heat from the first embodiment interior as well as moisture vapour. This is contrary to the present usage of this material.

G. Permeable tent walls

[0034] The current use of permeable materials in the tent industry are utilized in single-wall tents, such as lightweight mountaineering tents, whereby the single wall acts as both a breathable inner tent wall and a rainfly in one. The materials usefulness is based on the original concept, which is a wind and water repellant, breathable (clothing) fabric for use in the outdoors, particularly as active wear. The breathability is designed to keep you cooler during activity and dryer (therefore warmer) after activity, by allowing perspiration to evaporate through the material. The use of said permeable materials in said single-wall tents therefore cannot adequately offer a form of insulation because they permit the free movement of thermal energy. Furthermore, because the single wall functions as both inner and outer wall, the inner face of the single-wall tent is still prone to the accumulation of liquid water when temperature differences exceed the functional limits of the material.

H. Preferred alternate material for the fly jacket 120

[0035] Polyethylene naphthalate (PEN) is a new generation polymer and part of the polyester family. PEN out performs PET in many relevant areas, such as tensile strength and modulus, gaseous impermeability, thermal and ultraviolet resistance. However it is not yet in wide spread use and is currently more expensive to manufacture than PET. As demand for PEN products and PEN fabrics increase in the future, it may become the fabric of choice, especially for the high-end tent market. Its high tensile strength makes it an excellent choice for the ropes and tie cords of any tent.

DESCRIPTION OF FIGURE 2

A. Description of Figure 2

[0036] In Fig.2 we see the fly jacket 120 unfastened and open flat upon the ground. The four walls 123 now lay in a segmented fashion surrounding and joined with the four sides of the integrated base 122. An airtight fastening mechanism or fastener 240 is shown along the entire periphery of said walls 123. A series of hook and loop straps 242 are shown arranged in four sets of pairs, offset to one side of the inner periphery of said fasteners 240. The underside of the fastener guard 134 is also visible, shown offset to one side of each said wall 123.

[0037] The reinforced base 122, which extends across the entire middle section of the fly jacket 120 and part way up the lowest portion of the walls 123, shown best in Fig.1, has a permanent crease 244 machined into it. Said crease 244 is found at the inferior most portions of the walls 123. An alignment square 246 is seen medial to said crease 244, which is printed onto the reinforced base 122. A series of small peg holes 248 surrounds the aligning square 246. A semi circular segment or upper air vent opening 250 is shown missing from the lateral superior section of each said wall 123 of the fly jacket 120, just above said windows 132 and doors 130.

[0038] An elongated rectangular hole or lower air vent opening 252 can be seen below the two windows 132 of the unfastened fly jacket 120. These areas form part of a ventilation system, which have there own dedicated drawings and descriptions. An outer transparent window 253 is shown contiguous with the outer window 132 forming the inner surface thereof. The last feature is an isothermal film or reflective film 254, contiguous to the walls 123, covering the entirety of the shown surface thereof.

B. A brief description of the operation of Figure 2

[0039] Said crease 244 produces a consistent and uniform folding of said walls 123 and in conjunction with the alignment square 246, which is contemplated to form part of a colour coded system (not shown), together aid in the entire assembly of the first embodiment. The transparent windows 253 behave primarily as an alternate or additional means for illumination to the skylight 128.

[0040] The reflective film 254 forms an integral part of the insulation system, whereby disrupting the movement of heat into and out of the first embodiment. Before discussing the entire operation of the insulating system, again it is necessary to first look at additional drawings and their associated detailed descriptions. However, we will look at the materials contemplated by the inventor to achieve the proposed functionality.

C. Description of the reinforced base 122

[0041] A standard tent base is usually made of a non-woven or calendered heavy gauge waterproofed nylon (polyamide) and sometimes polyester. This is true of even an ultra lightweight tent. Relative to a nylon or polyester rainfly, said base is many times heavier thereof. Polyurethane is typical the waterproofing agent of choice used to protect the hydrophilic nylon, which as mentioned earlier has some durability issues and adds yet more weight.

[0042] Also, as the base 122 essentially forms an integrated groundsheet protector or footprint groundsheet as the bottom part of the fly jacket 120, it eliminates the need for a separate footprint groundsheet thereby making the first embodiment even more efficacious.

D. Contemplated materials for the reinforced base 122

[0043] The base 122 and walls 123 of the fly jacket 120 are a single entity, but in the present embodiment they are comprised of different materials. The integrated groundsheet or outer reinforced base 122, acts as the primary protective flooring of the first embodiment, contrary to current tent arrangements. The base 122 is contemplated to comprise of a flexible non-woven composite laminate that is reinforced with Dyneema fibers (ultra-high-molecular-weight polyethylene), known by those skilled in the art as Cuban fiber or CTF3 and is available through Dyneema, a subsidiary company to Royal DSM, Netherlands. The combination of materials forms an extremely lightweight and waterproof fabric having exceptional tear resistance and dimensional stability, making it an excellent material to protect the embodiment from abrasive and uneven surfaces encountered in the outdoors. However, this material is contemplated as more appropriate for high end and ultra lightweight versions of the first embodiment.

[0044] Other polyethylene materials are available such as a flash-spun high-density version, known as Tyvek, which is used widely in the building industry as an insulator. It is available from Dupont chemical company, in Delaware USA. The fiber is constructed of millions of extremely fine filaments that create millions of small pores, which resist bulk water and air penetration, whilst allowing water vapor to pass through.

[0045] The moisture vapour transmission rate of said polyethylene is only a fraction to that of the previously discussed fabrics contemplated for the superior tent wall 123 sections. However, the material has many valuable properties for a groundsheet that makes direct contact with a potentially moist surface. Thus said polyethylene is a very effective natural insulator and possibly negates the need for further waterproofing treatments. The high tensile strength to weight ratio of said polyethylene also makes lighter groundsheet gauges possible compared to typical nylon ones. Taken together this produces a lighter, stronger more insulating reinforced base 122.

[0046] A recommended woven nylon alternative is a very strong, abrasion resistant 420-denier diamond grid ripstop nylon, also available through Ripstop by the Roll. It is lighter than most conventional non-woven and woven groundsheet materials yet more tear resistant.

[0047] CTF3 is also a suitable material for the rain hood 126 and or skylight 128 seen in Fig.1, as it is available in a transparent form. However, these are suggested materials only and should in no way be considered limiting.

E. Metallisation of the reinforced base 122

[0048] Although thicker gauges of the polyethylene fiber or other similar materials would suffice to insulate and reinforce the bottom of the first embodiment, some materials could be combined with other fabrics and or a metallised film, to increase the base's 122 inherent insulating properties. High-density polyethylene is one such contemplated material that is available in a metallised fabric form, whereby metal vapour has been deposited onto the surface thereof in a special vacuum process. This is also available from Dupont chemical company.

[0049] Using said metallised polyethylene is contemplated to function well so long as the metallised surface has a protective layer or coating or alternately is sandwiched between a thinner protective bilayer. Having a multilayered base 122 adds complexity and potentially cost to the first embodiment, however the aggregate insulating effect of the added metallised verses non-metallised material is still considered superior by the inventor. A protective material with good transparency fabricated as thin as possible is suggested for the inward facing surface of the base 122, whereby the reflectance properties of the metallised fabric are only minimally decreased. High-density polyethylene is now available in a high quality transparent format.

[0050] The material could alternately comprise of at least one layer of the reflective film 254 sandwiched between layers of the chosen base 122 materials, though again the metallised polyethylene fiber alone displays significant tensile strength and insulating properties simultaneously. Whatever the final arrangement is, the boarder region of the base 122 between the crease 244 and the alignment square 246 should at least be metalised in the first embodiment.

[0051] Other materials could also be used for the reinforced base 122 such as woven high-density polyethylene, polyethylene naphthalate, cross-linked polyolefin, ripstop polyester, polyvinyl chloride etc. Additional weather shielding coatings could be applied to any of the above, such as Teflon Shield fabric protector (Dupont) or DuraShield, available from LifeLast Inc. Pflugerville, Texas USA.

F. First contemplated material for the reflective film 254

[0052] A first contemplated embodiment of the reflective film 254 is comprised of at least one layer of either a metallised polyamide (nylon) or polyethylene terephthalate. More specifically a dual coated aluminised high-density, biaxially oriented synthetic polyamide or polyethylene terephthalate. The thickness of either said material required for the purposes of the embodiment is contemplated to be > 4µm but < 50µm (microns) in thickness, with a substantial coating of vaporised pure aluminium in the range of 100 - 500nm (nanometer) or 0.1 – 0.5 microns, applied to either one side or both sides thereof. The materials are available from Dunmore Corp. in New Jersey, USA. Reflective films manufactured with dual metal coatings have better thermal barrier properties than coating one-side alone having the capacity to reflect radiant heat in either direction.

G. Description of first contemplated reflective film 254

[0053] Said films have many desirable characteristics such as high tensile strength to weight ration and tear resistance, afforded by their high modulus. Polyamide has a lower modulus than polyethylene terephthalate film of the same thickness. Polyamide has however, a substantially higher vapour transmission rate compared to other thin films, roughly 5 times greater than polyethylene terephthalate. Though as with other high modulus films, polyamide also tends to form permanent crease marks and wrinkle when manipulated repeatedly. When adhered to the fabric of the fly jacket 120 these imperfections translate to the superficial appearance thereof. Like all other tents the first embodiment is intended to be stored away in a compact fashion when not in use. The application of another thin film to the polyamide film however can mitigate this. This additional film could be made of polyvinyl chloride, polyethylene, silicone etc. Adding another layer will however minimally increase the cost, complexity and weight of the embodiment and it can only help prevent, not eliminate the appearance of permanent deformities within the substrate.

[0054] The simplest solution to this aesthetic problem is to freely suspend the reflective film 254 from the fabric of the fly jacket 120, wherein the film 254 is primarily attached to the peripheral edges of the underside of the walls 123, such that creases and wrinkles in said film 254 becomes irrelevant to the outward appearance of the fly jacket 120 fabric. It can be stitched, welded or glued etc. into place. An alternative is to minimally affix the film 254 to the fabric of the fly jacket 120 in a lattice or matrix fashion, thereby creating a different aesthetic and potentially functional effect, wherein a plurality of smaller pockets are formed between the fly jacket 120 fabric and reflective film 254.

[0055] Another contemplated solution for joining the film 254 to the fly jacket 120, in a more comprehensive way, is to fabricate the film 254 with a plurality of striations or grooves throughout, thereby allowing said film 254 to bend and fold at consistent places. The grooves will form a pattern and many different patterns could suffice so long as the grooves are sufficiently corrugated. This may also have the added advantage of reducing random permanent deformities to the fly jacket 120 fabric.

[0056] This is conceived because the smooth surface of the film 254 is married with the fly jacket 120 fabric, wherein said grooves face out, allowing the corrugations to float freely of the fabric. When seen from the opposite or fabric side, the pattern formed on the film 254 will appear in reverse, wherein the negative space between the grooves will now be seen as shapes in the fly jackets 120 fabric, possessing a different visceral quality. This is not only functional but could lend the fabric a distinctive aesthetic appeal.

[0057] The reflective film 254 can be affixed to the polyester fabric of the fly jacket 120 with a silicone based adhesive. It may be preferable to affix the reflective film to the polyester fabric during the weatherproofing process as the weatherproofing agent could double as an affixer.

H. First alternate material for the substrate of the reflective film 254

[0058] I contemplate a second embodiment for the reflective film 254 as comprising an alternate substrate to the aforementioned materials. This is a flexible, 20μm ultra thin pure silicone film (Elastosil film), available from Wacker Chemie AG in München, Germany.

I. Description of alternate substrate

[0059] Regarding deformity, said silicone film has tensile advantages that allow it to behave as an elastic substrate for the contemplated reflective film 254. Though its tear strength is about half that of polyamide, the silicone substrate can be stretched to as much as 300% of its original size without permanent elongation, afforded by its low flexural modulus and stretch recovery properties or 'healing properties'. Thus adhering a layer of silicone film to the fly jacket 120 will cause fewer visible deformities thereof. The inventor views lower tear resistance as a reasonable sacrifice given the substrates other properties and the fact that the fly jacket 120 is already significantly tear and puncture resistant.

[0060] The silicone films most desirable property is its exceptional water vapour permeability (>3,000g/m2/24h/20μm, even higher in humid conditions). This is roughly 8 times greater than polyamide and 40 times that of polyethylene terephthalate of the same thickness. Thus the silicone film is contemplated as better suited for providing a thermal barrier substrate that allows greater moisture permeation. This depends on the intended application of the embodiment though. The silicone film is also congruent with the waterproofed polyester or Silpoly. Silicone also naturally possesses excellent thermal stability, allowing it to perform perfectly even under the most extreme conditions.

Once the silicone film has been coated with the vaporized metal, the viscous quality of the silicone will be altered, whereby eliminating self-adhesion and making the material easier to work with.

[0061] Ideally the silicone film, considered by the inventor as being the most elegant and efficacious embodiment of the reflective film 254 substrate, will be a pure silicone rubber fabricated to <20µm, in the range of 4 - 5 µm, whereby the moisture vapour transmission rate would exceed 12,000g/m2/24h. At this thickness the silicone film would possess vapour permeability comparable to Gortex.

[0062] It is contemplated by the inventor that the thickness of the film substrate, used in the context of the first embodiment, is as small as practicably possible and acts more as a foundation for the vaporized metal, rather than an additional thermal material. However a wide range of gauges could be used to achieve different results.

K. Second alternate material for the substrate of the reflective film 254

[0063] Yet another contemplated alternative for the film substrate is a 15-micrometer biaxially oriented ethylene vinyl alcohol, available from Kuraray Inc. Japan.

L. Second alternate substrate for the reflective film 254

[0064] Ethylene vinyl alcohol or EVOH has exceptional barrier properties, and is very durable and fracture resistant. However, being so impervious and using the substrate in the manner devised, necessitates means for permanently circulating fresh air through the embodiment. It is therefore suggested that EVOH use in the first embodiment is subsidiary to the main film substrate. Its primary contemplated use in the first embodiment is for the transparent windows 253 and skylight 128. It could also be particularly useful in and around the other doors 130, windows 132 and air vents 138 to enhance the airtightness of these areas. However, EVOH is somewhat more complex and expensive to manufacture than other options. If the inferior wall 123 section requires improved water and air impervious properties than those currently stipulated, EVOH in film or resin form is a good choice.

[0065] Still other thin film polymer substrates would also be suitable for the first embodiment, such as high-density polyethylene, polyethylene naphthalate, polypropylene, polycarbonate, polyimide (Kapton), polyvinyl fluoride, polyolefin, etc.

M. Using multiple reflective film 254 layers

[0066] Suspending reflective film 254 from the underside of the fly jacket 120 is the presently preferred arrangement contemplated by the inventor. I have described the embodiment to comprise of a single film 254 thus far as a means of simplicity. Using two or three separate reflective film 254 layers is contemplated as the most efficacious arrangement for the first embodiment. Multilayering films assist in the material's heat management by reducing incident energy with each successive layer. However, means for suspending them from one another is necessary in order to fully utilize their thermal properties.

[0067] Any minimally affixing method will work, such as the matrix method discussed previously. In this way, consecutive layers of film 254 are divided up, allowing air pockets to form between the spaces thereof. Because the reflective film 254 layers are antistat (afforded by the alumina coating) and are composed of the same material, they tend not to stick to adjacent layers. Therefore, when the fly jacket 120 is erected, gravity will simply separate the individual film 254 layers from one another. This can be achieved through a variety of arrangements.

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[0068] Constructing the reinforced base 122 with multiple reflective film 254 layers can be accomplished during the production of the polyethylene fiber or alternate base material, whereby layers of said film 254 is sandwiched alternately between layers of the chosen base material. Multi film 254 layering without a neighbouring air space however is much less thermally insulating than when used in conjunction with one. The reinforced base 122 could be contemplated to comprise of a 3-dimensional layer, such as a honeycomb lattice, whereby tiny pockets of air are trapped between. However, upon compression of said layer the air pockets would disperse, making said layer redundant. Other methods are contemplated for attaching the film 254 directly to the base 122 such as adhesives like polyurethane, ethylene vinyl acetate, hot glue etc. and heat welding, stitching or the like. If reflective film 254 is used in conjunction with the base 122 material, some form of embedding the film 254 into said base 122 is recommended.

N. The vapourised metal

[0069] Metals other than aluminium can be vapourised in a vacuum and applied to a cold substrate, such as nickel, chromium, copper, silver, gold etc. or combinations of metals. There are at least two fabrication methods known by the inventor for the deposition of a metal vapour onto a substrate. The first is the more widely practiced evaporation deposition method, used to make micro-scale products such as metallised polymer film. In the context of the proposed embodiment, the evaporation deposition process would need to be performed repeatedly to the film substrate, in order for the formation of a metal coating capable of exhibiting the suitable contemplated thermal properties.

[0070] The second method is termed sputtering deposition. In this method, argon gas is used in the vacuum chamber instead of electricity. The vapourised material ballistically impacts the substrate, which can potentially damage it. However, an entire range of deposition methods is possible with sputtering, from the high-energy ballistic impact method to a low-energy thermalised motion method, whereby the ballistic particles collide with argon atoms on their way to the substrate. The low-energy thermalized motion method is achieved by increasing the background gas pressure and is the currently preferred deposition method by the inventor. It is generally a slower process for vapour deposition than the evaporative method however; multiple passes are not as necessary because the sputtering deposition method provides thicker coatings.

[0071] The ballistic impact sputtering method could be used to uniformly perforate the substrate on the microscopic level, whereby increasing its moisture vapour transmission rate many fold. This is contemplated as an alternate method for achieving a higher moisture permeation quality of any film substrate and or decreasing the inherent vapour impermeability of the vaporized metal coating. Both the thermalized motion and ballistic method could be employed to achieve certain properties. Other methods exist that could potentially achieve a similar outcome such as glancing angle deposition, wherein a template is formed that can than be used to manufacture microscopically perforated thin film polymers. The glancing angle deposition is also contemplated as a potential alternate means for a permeable application of vaporized metal to the substrate proper, whereby microscopic ridges and divets of alumina are formed generating a range of moisture permeability properties across the substrate. A simpler method of perforation would be to use a modified Schreiner process of calendaring, before or after metalisation.

O. Using the fly jacket 120 as substrate

[0072] In fact, it is contemplated by the inventor that the fabric of the fly jacket 120 proper can be manufactured with a metallised coating to one side thereof using either the sputtering deposition or evaporative method. This is perhaps the simplest and most cost effective means for adding insulation properties to the lightweight synthetic fabric contemplated by the inventor. The vapourised metal is considerably more thermally efficient and robust than a metallic pigment or metallic polyurethane coating and does not necessarily require a protective finish or film, making it extremely lightweight.

[0073] The silicone-weatherproofing agent of the fabric now acts as the substrate. Using the sputtering deposition method means the silicone may not require a sticky fluoropolymer resin or fluorination, before the deposition of the vapourised metal. This would negate at least the initial reflective film layer 254 and could be effective on its own. However, with the addition of just one reflective film 254 suspended from the fly jacket 120 in addition to the metal coating to the underside thereof, the efficacy of the first embodiment is contemplated to be notably enhanced. After a discussion of figures 3 through 7, we will then turn to a full disclosure of the functioning of the proposed insulation system of the first embodiment.

P. Other considerations

[0074] Metallic fibers, fibers containing metal filament threads or aluminized polyester that has been finely shredded and woven into a fabric could also be considered as functional elements within the first embodiment. The metallised film can be sprayed with special sealants if opened to the elements in anyway to prevent oxidization of the alumina, which marginally decrease its thermal efficiency while increasing its weather resistance. This is particularly relevant for the area at the base 122 where the outer door 130 is situated and the underside of the fly jacket 120.

[0075] Another alternate to using metallised thin film would be to use additional metallised fabric layers instead. An example of such a contemplated fabric would be a 10-denier calendered nylon (18 grams or 0.66oz per square meter), with or without a fine hydrophilic polyurethane coating to the outward facing side thereof, metallised using any of the above suggested methods. This would create a uniform arrangement of materials and potentially simplify manufacturing.

[0076] With regards to weight, the 40-denier ripstop polyester fabric weighs 31 grams (1.1oz) per square meter after weatherproofing. A 30µm, dual coated high-density aluminized polyethylene terephthalate film weighs approximately 12 grams (0.42oz) per square meter. The vapourised metal layer is so minuscule that it is virtually weightless. As such, the addition of the vaporised metal layer directly to the fabric itself, will add very little extra overall weight. If we calculate for one layer of said film to the weight of said fabric we arrive at a 38.7% gain in weight. This seems like a lot however, this weight is to the fabric only and the fabric considered here is very lightweight. Therefore, the added weight is small enough as to be virtually irrelevant in terms of most recreational synthetic tents.

[0077] The extra gain in weight is further mitigated by the thermal properties of the embodiment itself, wherein the need for other items such as additional warm clothing during the night, sleeping mats and heavier grade sleeping bags may no longer be as necessary. In the long run it may be more economical to carry the first embodiment. Moreover, because the extra weight is so minuscule and evenly distributed across the first embodiment, tent poles and other structural members do not need to be made thicker or stronger to accommodate the changes. This is an important point to consider because the poles of a tent usually constitute the greater part of the overall weight especially common synthetic recreational tents.

Q. Example

[0078] Lets look at an example to illustrate my point. The ‘Classic Dome’ 3-person tent by Oztrail Australia, which measures 205cm wide by 205cm deep by 125cm high and weighs 3kg. The size of the rainfly to cover said tent is about 9 square meters. The addition of one layer of the 12 gram, 30μm film would add just 108 grams to the fly. That equates to an overall weight gain of less than 4% to the three-person tent, even less when using a thinner film.

DESCRIPTION OF FIGURE 3

A. Description and operation of Figure 3

[0079] In Fig.3 we see a perspective view of an inner tent 355. Like the fly jacket 120, it is comprised of a series of openings, which form part of a plurality of inner walls 356, further including an inner door 357, with a correlating door (not shown) on the opposing wall side thereof. An inner window 358 is shown on the adjacent inner wall 356 to the inner door 357 with a correlating window (not shown) on the opposing wall side thereof. A pair of collapsible tent poles 360 provides structural support for the inner tent 355 whereby said poles 360 are shown under tension, retained by a series of fabric sleeves 362 and bracings 364. This design is well known to those skilled in the art. The inner tent 355 also has an integrated groundsheet or inner reinforced base 366, which encompasses the underside and bottom most edges of the inner walls 356, similar to the fly jacket 120. A series of inner tent securing points 367 surrounds the perimeter of said base 366, which communicate with the peg holes 248, seen best in Fig.2, whereby securing the inner tent 355 to both the fly jacket 120 and the ground underneath.

[0080] Just above the base 366 is shown an embodiment of the lower air vent 138, the lateral part of which is visible in Fig.1. At the apex of the inner tent 355 is shown a ventilation funnel or upper air vent 368. The upper air vent 368 has a brim 369 with fasteners 240 along its four circular edges, which join with the airtight fasteners 240 of the upper vent opening 250 of the fly jacket 120, also seen in Fig.2. The upper air vent

368 sits beneath the rain hood 126, thereby preventing rain from entering said upper air vent 368. The skylight 128 allows for overhead illumination when the upper air vent 368 is open.

[0081] Contrary to the fly jacket 120, the reflective material or reflective film 254 of the inner tent 355 is shown facing outward toward the surrounding environment, in other words the fabric is displayed in a reversed fashion to that of the fly jacket 120.

B. Contemplated materials for the inner tent 355

[0082] I presently contemplate that the inner tent 355 fabric be made of a 15-denier uncalendered polyester, with a hydrophilic polyurethane coating to the outer facing side thereof and a reinforcing ripstop weave throughout. This type of fabric is available from manufacturers such as Ripstop by the Roll in Durham, NC USA. The material has a good balance between weight and durability, weighing about 25g (0.9oz) per square meter.

[0083] Any of the other fabrics thus mentioned could be used for the inner walls 356. The material is contemplated to be very breathable yet meaningfully airtight, afforded by the modified polyurethane coating. The hydrophilic polyurethane forms the airtightness necessary for the proper functioning of the insulation system whilst assisting the centrifugal action of the pressure differential for the removal of moisture vapour from the inner tent 355 (discussed later).

[0084] The inner reinforced base 366 comprises of 300-denier diamond ripstop polyester. It's sold under the name HyperD 300 from Rip-stop-by-the-Roll, Durham, NC USA. While many higher-denier coated fabrics used for tent groundsheets are very stiff, HyperD 300 has been specifically designed to have a softer hand, making it more compact when packed away. This product is sold with a polyurethane coating to one side and a durable weatherproof coating to the other and weighs 110 grams (3.9oz) per square meter. The polyurethane coating adds roughly 30 grams (1oz) per square meter to the finished product and because its sister outer base 122 protects the inner base 366 from water penetration, the fabric need only by minimally coated with a sealant to ensure airtightness. Thus the fabric can be manufactured to a lighter gauge for the first embodiment without compromising its strength. Again, this is just one presently contemplated material and many other fabrics could be used.

[0085] The poles 360 of the inner tent 355 should be finished in titanium white or the like to enhance reflectance and help offset thermal bridging through the structural members.

DESCRIPTION OF FIGURE 4

A. Description and operation of Figure 4

[0086] Fig.4 shows a representation of the inner tent 355 atop the fly jacket 120 of Fig.2. This is a clear depiction of the thermal tent in a partially assembled state, in accordance with the first embodiment. The inner tent 355 is erected and aligned atop the fly jacket 120. The fasteners 240 along the periphery of the fly jacket 120 can now be brought together and enclose the fly jacket 120 around the inner tent 355.

[0087] This perspective shows the arrangement of different sections of the inner door 356, the inner window 358 and the outer window 132 and outer door 130. The inner and outer doors, 356 and 130 respectively, are constructed from said contemplated thermally insulated airtight material, as is the inner and outer windows, 358 and 132 respectively. The reflective film 254 is suggested as being affixed to the fabric immediately adjacent the airtight fastening mechanisms 240 around the inner periphery of the openings, regardless of the method used to suspend said film 254, thus allowing said openings to be opened and closed, without obstruction from said film 254.

[0088] The inner door 357 of the inner tent 355 has an additional soft fly screen door or mesh door 472 with a standard zipper 473 around its periphery, which can be opened or closed in isolation to the inner door 356. Similarly, the inner window 358 has a mesh window 474, both of which can be modified from within the tent interior 470. A novel inner transparent window 475 is seen contiguous to the inner windows 358.

[0089] When the outer door 130 and or outer window 132 are open, but the mesh door 472 and or mesh window 474 remain closed, greater airflow and light are permitted into the tent interior 470, while keeping unwanted insects out. Again, this arrangement is well known to those skilled in the art.

B. Insulating windows

[0090] The inner transparent window 475 is used in conjunction with the outer transparent window 253 to produce greater illumination within the tent interior 470, without compromising the insulating powers of the fly jacket 120 and inner tent walls 356. This is envisaged since the proposed material for the transparent windows (253, 475) is comprised of at least one layer of the impervious ethylene vinyl alcohol, whereby maintaining the airtightness of the adjunct inner and outer walls 356, 123 respectively.

[0091] When correctly aligned, the fly jacket 120 and the inner tent walls 356 form an especially airtight space that encapsulates the entirety of the inner tent 355 and tent interior 470. Let's now turn to look at some of these features more closely.

DESCRIPTION OF FIGURE 5

A. Description and operation of Figure 5

[0092] Fig.5 shows a comparative view of a large tent peg 576 and a small tent peg 578 with a rubber gasket 580. The large peg 576 is used to secure the fly jacket 120 to the ground, via securing points 136 found at the base 122 of the first embodiment. The large peg 576 has an elongated hooked head that is contemplated to facilitate better retention of the peg into the respective ground. When pitching on hard surfaces such as rocky ground, the hooked shaped head of the large peg 576 can be threaded through the securing points 136 and laid horizontally upon the ground, whereby a rock or other appropriately heavy object can be place there upon, increasing the tents overall stability. The smaller peg 578 is used to secure the inner tent 355 to the ground through the base 122 of the fly jacket 120. A grommet (not shown) surrounds the peg holes 248 in the base 122 of Fig. 2, which accommodate the insertion of the small peg 578 without causing damage to said base 122. The soft rubber gasket 580 of the small peg 578 is used to maintain a tight fit about the grommet via compressive force. Of course many different kinds of pegs are used in the camping industry with a variety of intended purposes and could be used in conjunction with the first embodiment very effectively. The large peg 576 could comprise of a folding mechanism, whereby decreasing unnecessary bulk when stored.

B. Freestanding ability

[0093] Additionally, the stability of the embodiment with its reversed bottom-up encapsulating design renders it a freestanding tent of the highest order. Thus, it is contemplated that no pegs are required during even mild windy weather, saving time on setup. This is a useful feature when one is in a hurry or is constantly moving locations and setting up the embodiment on a daily basis. It also enables the tent to be picked up and relocated easily should the camper change his or her mind. This feature will be discussed in more detail.

DESCRIPTION OF FIGURE 6

A. Description of Figure 6

[0094] Fig. 6 is a perspective view of an embodiment of an awning and rain hood pole array 680. This object consists of awning poles 682 that are constructed and assembled just like other tent poles well known to those skilled in the art. A rain hood pole array or rain hood poles 684 sit atop the awning poles 682. A series of couplings 686 are seen on the awning poles which hold the rain hood poles 684 under tension, whereby creating an elliptical dome arrangement that is suspended above the awning poles 682. This also increases the stability of the entire pole array 680. A clip and fabric tie (not shown) located at their intersecting points of both the awning poles 682 and the rain hood poles 684, help to secure the individual poles together.

B. Operation of the awning and rain hood pole array 680

[0095] The setup of the awning poles 682 is accomplished by first threading the awning poles 684 through a series of fabric bracings (not shown) on the underside of the awnings 124. At the underside of the lateral angles of the fabric, of both the rain hood 126 and the awnings 124, is found a reinforced fabric pouch (not shown) that stabilizes said poles and permits tension and thus rigidity of the fabric. The couplings 686 of the awning poles 682 are aligned with reinforced holes (not shown) on the topside of the awnings 124, found at the intersecting point of the two articles.

[0096] The rain hood 126 and accompanying skylight 128 is then assembled separately in the same manner. The rain hood 126 of the first embodiment is an individual entity, separate from the rest of the fly jacket 120, unlike the neighbouring awnings 124 which are a permanent feature of the fly jacket walls 123. The rain hood poles 684 and rain hood 126 is then placed under tension through manual effort and fitted to the couplings 686 of the awning poles 682. This type of arrangement should be familiar to those skilled in the art.

C. Operation of the rain hood 126

[0097] Let's refer back to Fig.1 for a moment. When the tent is fully assembled, spaces are formed along the upper tent corners between the inferior portion of the rain hood 126 and the superior portion of the awning 124, best seen in Fig.1. These triangular shaped spaces, in conjunction with the fly jacket 120 walls 123, permit airflow from the outdoor environment, up and under the rain hood 126 and into or across the upper vent 368. By being atop the tent in an unobstructed position, the upper vent 368 can receive airflow multidirectionally. The occupants inside the tent can then modify the desired amount of airflow. The lower air vents 138 can also be modified from within the tent. Both of these structures have dedicated figures and will be discussed in greater depth.

D. The operation of the awnings 124

[0098] Using large awnings 124 such as those depicted in Fig.1 are simple yet effective ways to offset rising temperatures within the tent interior 470. When the doors and or windows of the tent are open, they are partially or fully shaded when the awnings 124 are erected, whereby shading the tent interior 470 from direct sunlight. This is consistent throughout the day afforded by the breadth and depth of the awnings 124. However, other shapes and sizes can achieve satisfactory shading. The polyester fabric also has good reflective properties for protecting against harmful UV radiation. It is contemplated by the inventor that the awnings 124 and awning poles 682 are constructed in a manner that allows for their dismantling during high winds, such as a joining seam along the superior portion of the awning 124, whereby the two sides of said awning 124 can be separated from one another, rolled up and secured beside the outer doors 130 and windows 132 (not shown).

[0099] When one or more of the awnings 124 are withdrawn during cold weather, thermal radiation is permitted to enter the tent interior 470 via the transparent windows 253, 475 or mesh windows 474 and mesh doors 472. Direct sunlight to the walls 123 will generate even more thermal energy inside the tent interior 470. Furthermore the awnings 124 are contemplated to work independently of one another allowing greater versatility.

E. Aesthetics as functional elements

[0100] I presently contemplate the awnings 124 to be of a matte white, off-white or pearl white colour, comprising titanium dioxide dye, as this will further enhance reflectance during warm weather. However, the remainder of the fly jacket 120, including the walls 123, windows 132 and doors 130, as well as the polyester fabric used for the inner tent walls 356, windows 358 and doors 356, I presently contemplate a low sheen black, matte charcoal, dark greys etc. For the fly jacket base 122 and the inner tent base 266, I contemplate dark colours also. Of course any colour, combination of colours or colourful patterns would suffice.

[0101] The use of black dye forms part of the insulation system and will be discussed in Fig.9. The main advantage to using the dark colour for the reinforced base 122 is that it generally will show less dirt and scuff marks than light ones, as well as being congruent with the rest of the contemplated black fly jacket 120. Using black awnings 124 in keeping with the rest of the first embodiment may be more aesthetically pleasing overall as well as potentially more versatile.

F. Contemplated material for the awnings 124

[0102] I presently contemplate the awnings 124 to be made of the aforementioned polyester fabric (40-denier Silpoly or equivalent). The reflective film 254 could cover the top or underside of the awnings 124, however in the present embodiment they do not. However, other arrangements, awnings or even a separate tarp constructed in this fashion would be particularly effective at shading and cooling additional areas near the tent, such as a vestibule.

[0103] Polyester is better at retaining dye than nylon fabrics and will thus fade less over time. It is also more resilient to ultraviolet radiation, which is important considering its primary role as a shading member. Additionally, when using the titanium pigment as a reflector, the retention of its luster will help extend the life of the fabric, thus the performance of the fabric awnings 124 will be more reliable over time.

DESCRIPTION OF FIGURE 7

A. Description of Figure 7

[0104] In Fig.7 we see a cut away perspective view of the embodiment. There are two areas of interest; a cut away view of a thermal envelope 788 in the left hand bottom corner of the embodiment and a cut away view of the upper vent 368 and rain hood 126. The thermal envelope 788 is the only new feature presented in Fig. 7, however the inventor has added the cut away perspectives to clearly define previously discussed features. It can be seen that the poles 360 are the primary support about which the fly jacket 120 affixes to the inner tent 355. The poles 360 in combination with the hydrophobic properties of the polyester fly jacket 120, maintain tort walls 123 during and after events of wet weather. Wind is managed in the usual fashion such as a low profile design, pegs, tie downs and ropes when necessary.

B. Operation of the fasteners 240

[0105] The meeting of the fly jackets 120 airtight fastener mechanisms 240 can also be clearly seen in Fig.7, as can the hook and loop pole ties 242 contiguous to both said fastener 240 and the fastener guard 134. These elements of the fly jacket 120 overlap in a right to left fashion about the tent poles 360. The pole ties 242 are first used to help guide the fastener 240 into place. The fastener 240 along the periphery of the fly jacket 120 is offset to the left of the poles 360 when assembled. Once fastened up, the inward facing fastener guard 134 is secured over said fastener 240 to the adjacent outward facing fastener guard 134 on the fly jackets 120 adjacent awning 124. Said fastener guard 134 plays an important role in keeping the airtight fastener 240 clear of air pollutants that could otherwise accumulate in them during use and effect their operation.

C. Contemplated component for the fastener 240

[0106] An airtight zipper is presently contemplated as the simplest fastening mechanism 240 by the inventor. Lightweight zippers are available from Szip Zipper Manufacturing Company Ltd, Shanghai, China. They should have at least a 200mbar rating to be effective.

D. Alternate fastening mechanisms

[0107] The use of said fasteners 240 in the present embodiment is but one such fastening mechanism contemplated for achieving air tightness or near airtightness of the thermal envelope 788. Other fastening mechanisms would suffice, such as hook and loop fastening mechanisms along the entire periphery of the fly jacket 120 that are joined together and then folded upon itself, the folded downward facing side being then fixed to the adjacent awning 124 where another hook and loop fastening mechanism is positioned. This design could easily be incorporated together with the fastener guard 134. The weight of the hook and loop alternative is estimated to be comparable to airtight zippers. Another fastening mechanism that is potentially cost effective, very light weight and durable would a modified Ziploc mechanism, fastened with compressive force, such as those seen in reusable plastic bags, manufactured by such companies as S. C. Johnson & Son. Still other fastening mechanisms could be used to achieve similar results.

E. Enhanced wind resistance

[0108] Unlike the first embodiment fly jacket 120, a rainfly or weatherproof cover is conventionally draped over an inner tent module and secured to the ground. This design allows airflow under the fly making it susceptible to strong winds that can uproot the pegs and tie downs, especially when the ground is wet and puts unnecessary strain of the structural members and fabric panels. By reversing the erection of the rainfly, in contrary to current designs, the fly jacket 120 completely encapsulates the inner tent 355, creating a more stable tent. With the awnings 124 dismantled, the first embodiment has enhanced wind resistance, as the upward assembly creates a single solid object a top the ground. In this way, the fly jacket 120 can utilize downforce for stability much more effectively. Its encompassing nature also eliminates cold air and damp accumulation under the fly. Combined with the hydrophobic nature of polyester fiber and dual base arrangement it effectively makes thermal bridging and moisture penetration into the tent interior 470 virtually impossible. Overall this makes for a more robust, reliable, warmer and versatile tent.

F. Other advantages

[0109] In the left bottom corner of Fig.7 is shown the interior of the thermal envelope 788. Some additional advantages of containing the reflective film 254 within an enclosed space such as illustrated in the first embodiment include:

[0110] Mitigating damage to the delicate metallised membrane and preventing dust accumulation on the films surface, both of which can have a significant impact on the films performance.

[0111] The occupants of the first embodiment do not need to be exposed to the reflective surface, which can become unpleasant and disorienting, especially in glary environments such as alpine or artic regions.

[0112] It also mitigates the need for an additional film layer to protect the reflective film 254 or vaporised metal, making it lighter

[0113] Provides a safer internal environment to cook in and way to utilize a cooking stoves heat.

[0114] This is contrary to the prior art.

DESCRIPTION OF FIGURES 8 & 9

A. Description of Figures 8

[0115] Fig.8 and Fig.9 demonstrate the thermal envelope 788 more specifically. Fig.8 is a simplified representation of the embodiment, viewed from the side. In this, one can clearly see the aforementioned encapsulation of the inner tent 355 by the fly jacket 120. Here numeral 9 indicates Fig.9, which is an enlarged cross sectional view of the thermal envelope and its constituent parts.

B. Description of figure 9

[0116] Fig.9 is a preferred embodiment of the insulation system represented in cross sectional view comprising, a ripstop polyester fabric 990 with a contiguous silicone membrane 992 and thin vaporised metal layer 993. The outer walls 123 of the fly jacket 120 sit parallel to the inner walls 356, wherein a hydrophilic polyurethane membrane 994 is shown sandwiched between another vaporised metal layer 993 and the polyester fabric 990 of said inner wall 356. From left to right is shown an outdoor environment 995, the thermal envelope 788, a pair of suspended reflective films 254 within said envelope 788 and the tent interior 470.

[0117] As mentioned early, the polyester fabric 990 of at least the fly jacket walls 123 is contemplated as being colourised with black dye, more specifically a carbon black dye; wherein said fabric 990 is converted into a thin thermal collector or black body 996, the aggregate of the two parts. The term 'black body' refers to a perfect thermal or electromagnetic absorber of which said black body 996 is certainly not. However, the inventor is taking liberty of the term because it describes well the idealized functionality of the concept behind the use of carbon black in the first embodiment.

C. The black body 996

[0118] This so called black body 996 acts to reinforce the thermal boundaries of the thermal envelope 788, behaving as a heat absorber and distributer. The black body 996 is therefore contiguous to the vaporised metal 993, but more importantly the reflective film 254. If the fabric 990 and silicone membrane 992 were both colourised with the carbon black colourant, this would further enhance the efficacy of the black body 996. Carbon black is one of the most effective and commonly used radiant absorbers. Radiant absorbers are a type of light stabilizer that functions by competing with the chromospheres within synthetic polymers to absorb radiant energy. The absorbed energy is converted into heat, thereby slowing the passage of heat and additionally preserving the life of the material from the damaging effects of ultraviolet radiation.

D. Preamble to the operation of the Figure 9

[0119] The efficacy of the thermal envelope 788 works through the combined effects of slowing the radiation of heat through high reflectance and low emissivity, disrupting internal advection (vector field) and diffusion or convection in a poor conductive airtight or near airtight environment. This essentially creates a thermal reservoir or heat bath around the inner tent 355 rather than simply reflecting heat away or toward the tent interior 470.

E. Some definitions

[0120] The sun and the human body emit infrared radiation or heat into their respective environments through radiation. The reflective film 254, via the two principles of reflectance and emissivity, can slow the movement of this radiant heat down effectively. Aluminium has a very low emissivity of 0.03%. This means that as little as 3% of the radiant heat is potentially emitted off the side facing away from the heat source. Therefore, heat losses from a person's body to a colder outside environment can be reduced, as can temperature gains to an internal environment during warm weather.

[0121] However, the reflected heat from metallised reflective films must be reradiated into and agitate an adjacent air space to be truly effective. Moreover, said air space must be sufficiently airtight to prevent air infiltration which would disperse radiant energy.

[0122] Because the thermal envelope 788 of the first embodiment relies on air as insulation, if it could not prevent air leakage or infiltration, even in low amounts, it would render the first embodiment almost completely ineffectual, particularly in cold environments. This is seen in some of the prior art.

[0123] In this context, diffusion refers to the net movement of heat from areas of high concentration (warmer) to areas of low concentration (cooler). As already stated, the thermal envelope 788 of the present embodiment is intended to form a disruptive barrier to this movement of heat, rather than one that purely reflects heat back into or away from the first embodiment. A weakening of convection (advection and diffusion) within the thermal envelope 788 is conceived because the thermal envelope 788 is very airtight, it is insulated from the ground and the distances between the internal components is not very great. Convection currents have difficulty forming in the thermal envelope 788, not only because of limited space but also because of the presence of the two reflective film 254 layers, which disturb the natural vector field or movement pattern of the warm and cool currents through reflectance. This is why two films 254 are illustrated in Fig.9. Using more layers of film 254 enables the width of the envelope 788 to be increased exponentially. This disruptive action makes for an effective insulator in both extremes of weather, enabling the embodiment to be a truly four season tent.

F. R-value

[0124] A simple measurement used to gauge thermal resistance in the building industry is the R-value. It is frequently used to determine the rough overall insulation of a building, whereby every material used in the buildings construction is awarded certain R-values and a total R-value is established. R-values are calculated by dividing the materials thickness by it thermal conductivity. (R= d/k, where d is thickness and k conductivity). Air is a very poor conductor, which makes it a potentially good insulator. The thermal conductivity of air at 0 degrees Celsius is 0.0243 w/m2k. If we use the basic R-value equation R=d/k, 100mm of air at 0 degrees Celsius has a metric R-value of 0.72 (US4.1).

A 250mm has an R-value of more than 1.75 (US10). However, the R-value of a given volume of air, used alone as an insulator, is actually much less than this. The capacity for widening the thermal envelope 788 and or increasing the R-value of the gas within, is largely dependent on the ability to offset the formation of internal convection currents by trapping smaller units of air within the reflective film 254 layers, whilst maintaining the predetermined airtightness.

[0125] I presently contemplate a 120mm wide thermal envelope 788. The choice of using wider or narrower thermal envelopes 788 is driven by either the size of the tent or the specific climate rating desired. Using the equation above this would give the airspace an R-value of approximately 0.88 (US5). The reflective film 254 not only divides up the internal airspace, it also increases the overall insulation value further, however this is calculated differently based on the materials special properties, not on the materials thickness and as the thermal envelope 788 acts as a specific thermal entity, its thermal properties could be substantially more when taken together.

G. The operation of the insulation system during cold weather

[0126] During cold weather, thermal energy emitted from the body of the occupant inside the tent interior 470 first encounters the inner black body 996 or polyester fabric 990 and is to some degree absorbed and stored therein. The high emissivity of the carbon black dye (0.81) within the polyester emits at least 81% of that heat to its colder side. The remaining absorbed heat (roughly 20%) within the black body 996 begins to be distributed across its surface. This action of heat distribution through the relative uniform absorption of the black body 996 could also assist in combating convection currents.

[0127] Once through the inner black body 996, heat that enters the thermal envelope 788 and is reflected back into the airtight space via the first suspended reflective film 254. It then encounters the thin vaporised metal 993 and the process is repeated, vis-a-vis to a lesser extent. Some heat however is reflected back into the inner black body 996 and further absorbed and reabsorbed by it. The heat, emitted off the cold side of the first reflective film 254 however, is the primarily disruptive action of heat transfer via low emissivity. The emitted heat then encounters the second reflective film 254, which then agitates said air between the first and second films 254. This process repeats until the entire 'packet' of thermal energy is completely emitted out the cold side of the fly jacket 120. However before it reaches the outdoor environment 995, the outer black body 996 and the vaporised metal 993 of the fly jacket 120, micro-cycles with the second reflective film 254, absorbing and reflecting some of that emitted thermal energy.

[0128] As previously mentioned, passive solar can be used by the black body 996 of the fly jacket 120 on cold days to further contribute to the thermal barrier which is most effectively utilized when the awnings 124 are dismantled. When greater illumination of the tent interior 470 is required, the use of the transparent windows 253, 475 on cold or hot days can bring even more warmth and/or light into the tent interior 470, without compromising the thermal envelope 788.

H. The operation of the insulation system during hot weather

[0129] During hot weather, essentially the reverse occurs. The black body 996 of the fly jacket 120 first absorbs incoming radiant heat from the outdoor environment 995. The heat then encounters the reflective films 254 reflecting heat back into the underside of the fly jacket 120 where it encounters the outer black body 996 and vaporised metal 993. The low emissivity of the reflective films 254 impedes heat transfer from penetrating further into the thermal envelope 788. This heat is further reflected back into the airtight space where it is temporarily housed, whereby slowing the migration of heat into the tent interior 470. The black body 996 and contiguous vapour metal 993 of the inner walls 356 further impedes heat transfer directly into the tent interior 470 through absorption and reflectance.

I. Why black?

[0130] Although counter intuitive, the carbon black colourant of the polyester fabric 990 which constitute the so called black body 996, works more effectively during hot weather than a white colourant. The black fly jacket 120 can reach higher surface temperatures, converting more radiation into heat. This heat can then be easily dispersed by a gentle breeze. Furthermore, the convection currents driven by natural ventilation via the ventilation system can more readily expunge the formation or accumulation of warm air inside a black interior (discussed later).

[0131] As mentioned above, in colder climates the black body 996 acts to reinforce the boundaries of the thermal envelope 788 by behaving as a thermal absorber. Also, given that the reflective film 242 is largely impermeable to light, using lighter coloured fabrics to admit light directly through the walls and into the tent interior 470 is no longer applicable. Varying shades of other dark colours could also be used effectively as a heat absorber and distributor; the choice depends on the desired aesthetic and functional ends. In terms of illumination, the first embodiment therefore behaves more like a canvas tent rather than a synthetic one.

[0132] There are many possible variations of the black body 996. Such as colourising the reflective film 254, adding one or more layers of colourised film or fabric between the polyester fabric 990, colourising one side of the polyester fabric 990, colourising the silicone agent before application or utilizing a texturised black body etc. However, the working efficacy of the insulation system is not dependent on the presence of the black body 996 and in conceived only as a weightless enhancer thereof.

J. Non-pneumatic envelope

[0133] Typical vapour pressure differences are much larger than typical air pressure differences. This is the simple principle in which the non-pneumatic thermal envelope 788 is based and conceived by the inventor as a highly stable, reliable and effective insulation system, regardless of ensuing weather conditions.

[0134] Because the thermal envelope 788 is non-pneumatic, not only is airtightness easily maintained but also the threat of puncture is essentially eliminated. Moreover, repairs and maintenance to the thermal envelope 788 can easily be carried out. In fact, even if a significant tear were to occur in the fly jacket 120, during a storm for example, and one was to then crudely repair it with gaffer tape, the thermal envelope 788 will still perform extremely well.

[0135] Omitting insulation material of any kind also lends the first embodiment another unique advantage as a survival shelter. This is because the operation of the insulation system is unchanged by dampness or moisture accumulation inside the thermal envelope 788. This is particularly relevant in a situation for example, in which ones clothes and or gear has become damp or soaked through during activity and is the only source of protection from the cold night air.

K. Humidity as a driving force

[0136] Unlike typical tent arrangements in which condensation is managed solely by ventilation, wherein mesh paneling in an inner tents wall vent moisture vapour to the underside of the rainfly, the first embodiment instead utilizes diffusion to remove condensation without the need for excessive ventilation. This is particularly noteworthy for tents or shelters designed for winter conditions.

[0137] During cold weather, the higher indoor temperature of the tent interior 470 is buffered against the outer environment 995 by the moderate humidity of the thermal envelope 788. This vapour pressure differential between the three environments drives moisture vapour out of the tent interior 470 and through the thermal envelope 788. The hydrophilic (water attracting) membrane 994 on the outward facing side of the inner walls 356, pulls moisture vapour through the hydrophobic (water repelling or more correctly 'absence of attraction') polyester 990 and into itself, whilst simultaneously performing as an effective gaseous membrane. This vapour condenses on and within said membrane 994. However, because the thermal envelope 788 has the potential for maintaining a higher temperature, it can accommodate more moisture vapour and therefore preclude the accumulation of liquid moisture. The different vapour pressure of the thermal envelope 788 and the colder outdoor environment 995 continue to move said vapour centrifugally. The vapour passes through the reflective film(s) 254 (provided by their high moisture vapour transmission rate or microscopic perforations) and reaches the underside of the fly jacket 120. Here the moisture is attracted to the permeable upper third of the outer wall 123, where it is finally eliminated via diffusion or capillary action.

[0138] During hot dry and moderate humid weather, the same process of diffusion will occur. Condensation build up (sweating) on the outdoor surface of the fly jacket 120 is a positive indication that the thermal envelope 788 is actively reducing heat loss through the walls of the first embodiment.

[0139] In highly humid weather the ability of the thermal envelope 788 to utilize pressure differences to remove vapour will be diminished. Firstly, it must be said that the inventor is not aware of any tent or shelter type that can perform well in highly humid conditions without the use of an air conditioning unit. Generally it is only the ventilation that can offer some relief from the saturated air. However, it is contemplated that the first embodiment would out perform any tent on the market today in preventing the infiltration of warm humid air. Furthermore, the versatility of the ventilation system provided for the first embodiment is considered superior to those known by the inventor, for the circulation of fresh air into a tent interior. The insulation system and permeable materials could also be modified to specifically handle such conditions, such as using materials providing higher permeation rates or blocking panels and channels to collect invading humid air.

L. Other considerations

[0140] Metalised films have great potential and usefulness within the outdoor and camping industries. Though their uses today are limited to emergency blankets, thermal groundsheets, compact emergency sleeping bags and insulated bevy bags. However, most of these products are made from metallised PET or equivalent, which if not modified behave as vapour retarders. They therefore become uncomfortable when used in close contact with the body for any length of time. It is also difficult to regulate the reflected heat from such articles. Furthermore they do not easily contour to the shape of the body which make gaps form, that allow cold air to infiltrate and drive heat away from the body. These problems are eliminated when using metallised films in the manner devised.

DESCRIPTION OF FIGURES 10 & 11

[0141] The final consideration when making an effective insulated tent is adequate ventilation. In fact, well-placed ventilation mechanisms can significantly assist the insulation in sustaining optimal internal temperatures. The remaining drawings detail a presently contemplated version of such an apparatus. Fig's 10a-d shows the underside of the exterior portion of the upper vent 368 as viewed from directly below. Fig.10e is a perspective view of the upper vent 368 as viewed from inside the tent interior 470.

A. Description and operation of Figures 10a – d

[0142] In Fig.10a we see a representation of the underside of the upper vent 368 in the closed position. An exterior upper ventilation door 1098 constructed of four identical fabric flaps can be seen with a quarter-circle form. Said doors 1098 have airtight fasteners 240 along their straight edges, which communicate with the corresponding fasteners 240 on the periphery of the two adjacent doors 1098. In the closed position the zippers meet in the center of the vent 368. Reflective film 254 or vaporized metal 993 cover the interior surface of the ventilation doors 1098. Fig.10b shows the upper vent 368 in the one-quarter open position. Above the door 1098 is revealed a mesh screen 1000. When open, the doors 1098 are held in place by a plastic tie 1002 and a fabric loop 1004, by which the said tie 1002 is threaded and affixed. The tie 1002 is attached near the lateral side of the door 1098 by a small piece of fabric 1006 stitched near its outward periphery. In Fig.10c we see the upper vent 368 in the half open position and finally in the fully opened position in Fig.10d. The adjustable nature of the upper vent 368 optimises the amount of airflow into the tent interior 470, maintaining the comfort levels desired by the occupants.

B. Description and operation of Figure 10e

[0143] Fig.10e shows the upper vent 368 as seen from inside the tent interior 470. A ventilation interior or upper vent interior 1008 is visible from this perspective. This is the interior perspective of the protruding funnel section of the upper vent 368 seen best in Fig.3. Adjacent to the external vent doors 1098 of the upper vent 368 contiguous with the upper portion of the inner tent walls 356, is seen an internal vent door 1010. The internal door 1010 is identical in size and shape to the external doors 1098 less the four divisions. A circular airtight zipper 1012 is used on the circumference of the internal door 1010 to seal the vent interior 1008 from the tent interior 470. When opened the internal vent door 1010 is held in place with a tie and loop 1013 mechanism. About the circumference of the upper vent 368 is shown a heat shield 1014 and four striations, each containing three parallel lines representing both an inner tent seam 1016 and a seam sealant and/or sealing tape 1018. Seam sealing tents will enhance air and water tightness. This is well known to those skilled in the art.

C. Contemplated materials for the air vent doors 1098 and 1010

[0144] The external vent doors 1098 are contemplated as comprising a multilayered fabric that is highly breathable, such as those contemplated for the superior inner tent wall 356 section. Of the suggested materials described back in Description 1-c, I presently prefer the Flashpoint fabric that utilizes the fine outer shell and polyurethane membrane. With a modified shell, some permeation of fresh air into the tent interior 470 would be possible even when in the fully closed position, as shown in Fig.10a. It also acts as another heat extractor during warmer weather when closed off from the mid day sun. The internal vent door 1010 however, is impermeable, made of said Silpoly material, allowing the occupants to shut off the upper air vent 368 completely from the elements.

D. Operation of the ventilation system

[0145] The upper vent 368 performs several tasks. To access the external adjustable doors 1098 of the upper vent 368, one must first open the internal vent door 1010. Apart from regulating fresh air into the tent, the upper vent 368 also doubles as a skylight for illuminating the tent interior 470 when opened. The transparent skylight 128 section of the rain hood 126 facilitates this. The amount of illumination is therefore concurrently adjustable, by both the external vent doors 1098 and the internal vent door 1010. The reflective layer on the surface of the vent interior 1008 magnifies the amount of light coming through the skylight 128 and into the tent interior 470. When the internal vent door 1010 is closed, the vent is airtight and all surfaces of the vent interior 1008 are coated in reflective material, as is the vents surface facing into the thermal envelope 788.

This arrangement forms an unbroken facility of the thermal envelope 788 regardless of whether the upper vent 368 is either opened or closed.

E. The operation of the heat shield 1014

[0146] The heat shield 1014 is used to protect the surfaces surrounding the upper vent 368 when cooking is required inside the tent interior 368. This is sometimes necessary when cold, wind or rain prevent outdoor cooking and additional shelter, such as when a vestibule is not available or appropriate. A sister heat shield (not shown), more specifically a flame retardant reinforcement, is affixed at the center of the inner base 366 positioned directly under the overhead heat shield 1014. This surface is used to place the cooking stove on and for food preparation. The heat shield 1014 also helps reinforce the upper vent 368 and surrounding seams 1016. However, this is only one embodiment and neither necessary or appropriate for many other embodiments. All seams 1016 throughout the tent should be treated with seam sealant and or seam sealing tape 1018 to ensure quality, weather resistance and most importantly airtightness. Again, the degree and extent of seam sealing is determined by the final outcomes desired by the manufacturer.

F. Contemplated materials for the heat shield 1014

[0147] I presently contemplate that the heat shield 1014 be made of a thin meta-aramid material, which is available from Dupont chemical company in Delaware, USA under the trademark Nomex. This material is actually a calendered paper and somewhat delicate which makes it inappropriate for the cooking area, unless a hardwearing finish or protective material is used in conjunction with the Nomex. Any lightweight, heat resistant and or innately flame retardant material or material altered by flame-retardants will do, such as polybenzimidazole (BPI), Mylar-Nomex laminate, fire retardant polyimide, coated nylon, wool etc. The heat and flame retardant surface below the upper vent 368 affixed to the base 366 should not only be hardwearing enough to handle the demands of cooking but also non-toxic to ensure safe food preparation.

G. Description and operation of Figures 11a & 11b

[0148] Fig.11a & b show a similar ventilation design but with a rectangular shape. Fig.11f is a cut away perspective view of an embodiment of the side vent or lower air vent 138, which is most clearly visible in Fig.3. Like said upper vent 368, the lower vent 138 has both an internal vent door 1120 and an external vent door 1122. Attaching to both said doors 1120, 1122 is found a flexible fastening mechanism or vent fastener 1126. Opening the internal vent door 1120 with the flexible vent fastener 1126 enables access to the lower ventilation interior or vent interior 1124, whereby access to the vent external door 1122 is made possible. Both doors possess an airtight zipper 1128 along three sides and a curved corner at one end, whereby the doors can be opened in one continuous movement using the action of only one hand.

[0149] Just above the curved airtight zipper 1128 of the external door 1122 is shown an outer airtight zipper 1132, whose purpose is to join in an airtight fashion to the opening 252 below the window 132 of the fly jacket 120. Bordering the external door 1122 is a mesh screening 1130. When joined with the fly jacket 120, the lower vents 138 retain a ridged shape. This is true of the upper vent 368 also which is held in a ridged form via the openings in the brim 369 to which the tent poles 360 are inserted (best seen in Fig.3). Both elements are designed to be collapsible and thus compact when unassembled.

[0150] Like the upper vent 368, which has reflective film 254 on both its ventilation interior 1008 and contiguous exterior, the lower vents 138 equally possess said reflective material on their corresponding interior and exterior surfaces. A tie and loop mechanism (not shown) similar to the mechanisms used in the upper vent 368 shown in Fig's 10a-e, secure the vent doors to the sides when in use. The amount of fresh air desired is modified by the positions of the two vent fasteners 1126. The vents 138 also act as another, albeit lessor form of illumination.

H. Description and operation of Figure 11g

[0151] Fig.11g is a perspective view of the lower vent 138 with the accompanying vent fastener 1126 shown in the closed position. Like the upper vent 368, the lower vents 138 can be opened and closed from within the tent. Many tent designs require the removal of a window or ventilation cover on the outside of the rainfly, requiring the occupant to exit the tent to adjust air and illumination levels. This can be frustrating, as any further adjustment of the window or vent would entail further ventures outside. This problem is eliminated in the present embodiment.

[0152] This is the presently contemplated ventilation system only, and is not in any way, intended to be limiting. Many possible shapes, sizes, configurations, modifications etc. with operating equivalencies or better are conceivable apart from those contemplated for the first embodiment.

I. The versatility of the ventilation system

[0153] The ventilation system of the present embodiment is designed as a whole system, whereby the upper and lower vents are used in tandem to achieve optimal airflow. During hot weather for example, the warm buoyant air that accumulates inside the upper portion of the tent interior 470, can be driven out of the upper vent 368 when the lower vent 138 is opened, via natural ventilation. When air passes over the fly jacket 120 and or under the rain hood 126, it moves across the surface of the opened upper vent 368, which draws fresh air through the opened lower vent 138. The position and structure of the vents are utilizing the stack effect to force air through the first embodiment at a greater rate than would be otherwise possible and the airtight thermal envelope 788 helps direct these thermal currents more specifically .

[0154] During warm weather when the lower vents 138 are opened in conjunction with the upper vent 368, the increased pressure difference between the indoor and outdoor environment, enhanced by the thermal envelope 788, forces fresh air through the lower vent(s) 138 at a greater rate than in a non-insulated tent. This fresh air drives the warmer buoyant air out of the upper vent 368 like an exhaust flue.

[0155] The upper vent 368 can also utilize Bernoulli's principle, whereby the faster moving air outside and above the first embodiment can drive less turbulent warm air out of the tent interior 470, via said upper vent 368. Furthermore, because the upper vent 368 can operate in a multidirectional way, it is rendered even more effective.

[0156] During cold weather, fresh air can be equally driven about and through the tent in a very controlled manor, afforded by the highly customizable and internally accessible ventilation system. It is also a more convenient way to adjust the internal climate by eliminating the need to venture outdoors. This is of particular relevance during the night. In the snow or cold alpine regions for example, the pressure differential formed by the insulation means the vents do not need to be opened as much in order to attain sufficient amounts of fresh air.

[0157] If temperatures rise to very high degrees and or in the event of warm winds, the windows and door of the tent can be opened if required. Also, accumulated warm air inside the thermal envelope 788 during very hot weather can be expunged from the airtight space during the evening by opening the fly jacket 120 for a brief period of time.

If the air is cold but the sun's rays are shining, then the transparent windows 253, 475 can be utilized and stimulate the ventilation system by passive solar.

[0158] The versatility of the natural ventilation system of the first embodiment is accomplished through the combination of the thermal envelope 788, which forms the thermal bath that divides the interior from the exterior, the mechanisms and locality of the ventilation openings and natural laws.

DETAILED DESCRIPTION OF SECOND EMBODIMENT

Brief summary

[0159] A second embodiment of the non-pneumatic thermally insulated tent has been contemplated as an even lighter and more compact version of the first embodiment, wherein the necessity for any kind of fastening mechanism required for providing airtight thermal insulation is now minimised or even made redundant.

DESCRIPTION OF FIGURES 12 & 13

A. Description of Figure 12a

[0160] Fig.12a is a perspective view of a second embodiment of the thermally insulated tent comprising of an integrated structure, wherein the fly jacket 120 and inner tent 355 seen in Fig.2 and Fig.3 of the first embodiment respectively, are instead contemplated as a single entity.

[0161] First is seen a large vestibule 1234, comprising of an entrance or vestibule door 1236, a set of vestibule sidewalls 1238 with a reinforced weatherproofed edging or vestibule edging 1239 surrounding the peripheral portion of said door 1236 and said sidewalls 1238. A side section of a reinforced base 1240 is shown which form the lower section of a plurality of external tent walls 1242, together forming the greater portion of the second embodiment exterior. Interceding the vestibule edging 1239 and said base side section 1240 is shown a semi curricular tent pole access 1244. At the foot of the said access point 1244 is seen a small securing point 1246. Above this is shown a sloping rain hood 1248 with a large transparent skylight 1250 subdivision, which together form a gable like structure over an external roof 1252. A vestibule pole 1254, partially visible on the underside of said rain hood 1248, provides structural support. Deep to the periphery of the roof 1252, below the skylight 1250 is seen part of an external air vent 1256.

B. Description of Figure 12b

[0162] In Fig.12b we see a cut away perspective view of the second embodiment with the vestibule door 1236 retracted, wherein said door 1236 is held in place by a pair of fabric ties 1257. This affords a view into a front external portion of a module revealing an external door 1258 in the closed position. Bordering the inferior portion of the external door 1258 is shown a section of the reinforced base side section 1240 contiguous to the vestibule edging 1239 of the revealed vestibule sidewall 1238. The cut away section shows an opened internal door 1260 of an inner tent 1261, exposing a tent interior 1262. The vestibule pole 1254 can be seen communicating with a module pole 1264, terminating at the same location. At the upper margin of the cut away view is revealed a small segment of a pole sleeve 1266, affixed to the underside of the external tent wall 1246, wherein the module pole 1264 is deposited. Behind said module pole 1264 is seen an internal wall 1268 with an internal reinforced base side section 1270 attached to the bottom edge thereof, further including a contiguous broad under surface of a reinforced base 1272. Between the internal wall 1268 and external wall 1246 is a thermal envelope 1274.

[0163] Numeral 13 indicates Figure 13, which is an enlarged representation of an opened pole access point 1244.

C. The operation of the second embodiment

[0164] The second embodiment is contemplated as comprising said materials, utilizing said suggested methods of construction, insulation methodology, means for ventilation and condensation management, as the aforementioned first embodiment. The essential difference between the first and second embodiment is the elimination of the separate fly jacket 120 used to surround the inner tent 355, thereby forming said thermal envelope 788. Instead, in the second embodiment the two elements are one, though they behave in exactly the same way. The under surface of the reinforced base 1272 forms the bottom of the entire second embodiment.

[0165] The internal walls 1268 are suspended from the external walls 1246 via the tension provided by both the module poles 1264 and vestibule pole 1254 and the external walls 1246. In conjunction with the pole sleeves 1266 on the underside of the external walls 1246 and rain hood 1248, are a series of bracings (not shown) affixed at intervals between the internal walls 1268 and external walls 1246. The bracings help to stabilize and position the inner tent 1261 correctly within the confines of the external walls 1246, helping give the second embodiment a consistent shape and performance in the same manner as the alignment square 246 of the first embodiment.

[0166] The external roof is suspended above an internal roof (not shown) by the crisscrossing action of the module poles 1264 via the poles sleeves 1266 and associated said bracing. These elements do not appear in the drawings of the second embodiment because they are represented clearly in Fig.3 and 4 of the first embodiment and are well known to those skilled in the art.

[0167] The self-aligning capacity of the second embodiment makes for a simplified setup and never exposes the delicate reflective film to the elements. Inside the second embodiments thermal envelope 1274, can of course be any of the previously posited components thus discussed in the detailed description of the first embodiment.

[0168] The external air vent 1256 is also contemplated to function similarly to the ventilation system of the first embodiment, wherein more than one air vent or window is recommended but not shown by the inventor. The rain hood 1248 acts as an awning similar to the awnings 124 described in the first embodiment. The skylight 1250 section of the rain hood 1248 is large enough to provide ample illumination of the tent interior 1262 without the addition of more openings. This of course is just one contemplated arrangement and is in no way meant to be considered limiting as there are many other ways to effectively employ the integrated structure proposed in the second embodiment.

D. Description of Figure 13

[0169] Fig.13 shows the pole access 1244 in the opened position with the second embodiment erect. A portion of the external walls 1246 and contiguous reinforced base side section 1240 are seen surrounding said access 1244. The access 1244 is seen here lying opened on the ground, which reveals one of the module poles 1264 underneath. This is held in position under tension, by a steel pin 1376 that is inserted into the end of said pole 1264 that is joined near the junction of the base side section 1240 and broader base surface 1272. This kind of arrangement of said pole 1264 and said steel pin 1376 is well known by those skilled in the art. Around the periphery of the access 1244 is an airtight fastening mechanism or fastener 1378 that communicates with the correlated section of fastener 1378 on the base side section 1240. Above the fastener 1378 contiguous to said base side section 1240 is shown a weatherproofing strip of fabric or pole access fastener protector 1380.

E. Operation of the pole access 1244

[0170] The second embodiment is first laid flat upon the ground in the usual fashion. The pole access 1244 is opened and the vestibule pole 1254 and module poles 1264 are then inserted through the entire length of their respective poles sleeve 1266, contiguous with the rain hood 1248, external walls 1246 that crisscross the external roof 1252 of the inner tent 1261. Said poles are then consecutively inserted into said steel pins 1376 and placed into a tensioned state. Once this is accomplished only then is the second embodiment secured to the ground with pegs via the securing points 1246, seen best in Fig.12a. The order of assembly is suggested as the second embodiments poles are contemplated to first require manipulation into a position of tension before securing the second embodiment to said ground. The pole access 1244 is then fastened closed by the contiguous fasteners 1378, wherein the strip of fabric 1380 above said closed fastener 1378 is further folded downward, protecting said fastener 1378 from the elements.

F. A lighter embodiment

[0171] When the invention is arranged in the manner outlined above, the main advantage over the first embodiment is the elimination of large amounts of fastening mechanisms 240 along the periphery of the separate fly jacket 120 (see Fig.4). The second embodiment is contemplated to use less than 10% of the required fasteners needed to assemble the first embodiment in an airtight fashion. In this way the second embodiment can be contemplated as an ultra light version of the first embodiment.

[0172] However, any and all other contemplated variations of either of the embodiments can utilize the separate or integrated model or a combination of the two. Just a portion of a standard tent could utilize the embodiment, such as the sleeping quarters. There are many factors determining this, some of which include, shape, height, scale, functionality, design limitations, complexity, cost, target market etc.

CONCLUSION, RAMIFICATIONS AND SCOPE

[0173] Many improvements, new uses and advantages are punctuated throughout the body of the detailed description for which I have chosen to surmise briefly here.

[0174] They include but are not limited too:

i) Enhanced weather resistance,
- unaffected by moisture accumulation,

ii) Non-pneumatic (low pressure) insulation much more reliable and practical,
- puncture problem eliminated, maintenance and repairs made simple,

iii) Highly insulating yet lightweight,
- insulation to weight ratio solution for ultra lightweight and lightweight tents,

iv) Encapsulating design utilizes down force to combat high winds,
- superior freestanding stability,

v) Effective in both hot and cold climates,
- versatile enough for all seasons and many disparate environments,

vi) Radiant barrier enclosed and protected from dust and damage,
- no glare or excessive thermal reflectance, no reduction in efficiency,

vii) Reduces the necessity for other camping gear,
- integration of footprint groundsheet with rainfly etc.,

viii) Improved mechanism for condensation removal,

- creates a more comfortable and healthier living space,

ix) Carbon black body 996,

- simple yet effective, weightless insulation enhancer,

x) Natural ventilation system that augments thermal properties,

- customisable from within the tent interior,

xi) Economical design that streamlines manufacturing,

- simplicity of concept facilitates broad applicability and flexibility.

[0175] Some other advantages exist that were deemed not important enough to mention in the detailed description. Such as, noise reduction through the double insulated airtight walls, ensuring a better nights rest; light impermeability of walls, allowing occupants to sleep more comfortably after sunrise; thermal base enhances performance of sleeping mats or eliminates their necessity; provides a realistic basis for integrating a pneumatic floor section or bed into inner tent groundsheet.

[0176] Thus the reader will see that at least one embodiment of the thermally insulated tent can provide any tent or shelter type with a simple, reliable, lightweight and economical way to combat the challenges of seasonal variation, day-to-night temperature differences and the diversity of climates around the world.

[0177] While my above descriptions contain many specificities, these should not be construed as limitations on the scope, but rather as an exemplification of two embodiments thereof. Many other variations are possible. For example:

- [0178] No reflective film could be used. Instead, only the airtight space acts as the insulator, however the distance between the two walls would need to be significantly reduced and or multiple carbon black layers used to enhance the air as insulator.

- [0179] Using many additional walls, partitions or breaks within the airtight space, essentially the opposite of the above statement such as a plurality of reflective film layers that form a 3 dimensional structure within the envelope. Said film could be suspended simply with air pockets or with an additional non-reflective layer. The added weight renders this alternative only applicable for heavier and or more permanent tents and shelters.

- [0180] The fly jacket 120 and inner tent 355 of the first embodiment could be a partially integrated unit, whereby the fly jacket 120 is joined permanently to at least one side of the inner tent 355, whilst still allowing for the full encapsulation of the inner tent 355. This shaves some weight off the first embodiment by eliminating at least one entire length of the fastening mechanism.

- [0181] An alternate fly jacket that joins horizontally around the base of the inner tent 355 instead of connecting vertically at the corners thereof. Or a fly jacket that joins horizontally around the base of the inner tent 355, instead of connecting vertically at the corners and is attached permanently to one or more sides of the inner tent 355 etc.

- [0182] Utilizing only a part of the first or second embodiments in a tent or shelter, such as tent walls, roofs, floors etc. to enhance insulation in these regions only, such as a marquee roof, with or without an encapsulating base, with or without any of the above-mentioned alternatives or derivatives.

- [0183] Utilizing the embodiment in very small shelters such as bivy bags and swags, sleeping bags or compact emergency gear, reducing the need and thus weight of fiber infill insulation or heavy gauge weatherproofed fabrics. Or utilizing the embodiment in unusual camping articles such as hammocks and hanging tents etc.

- [0184] Utilizing the embodiment in pneumatic mattresses for increased insulation from the ground.

- [0185] Utilizing the embodiment in sun shelters or shading tarpaulins for beach goers etc.

- [0186] Utilizing the embodiment in inflatable swimming pools to maintain, capture and distribute heat.

- [0187] The embodiment could be utilized as low pressure insulation bags, packed into and under floors, walls or ceilings and roofs of buildings. They would be cheap and easy to install given their nature. They could be utilized in multi level buildings and the like, enhancing floor-to-floor insulation. Further, if the bags were filled with an inert gas like argon (which is heavier than air and therefore slower to permeate a thin film and or fabric) their life and thermal properties could be extended over time.

[0188] Accordingly, the scope should be determined not by either the first or second embodiment or alternate embodiments listed here, but by the appended claims and their legal equivalents.

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CLAIMS: I claim:

1. [0189] A tent or shelter of the type comprising a plurality of fabric panels, a frame and a covering, the improvement wherein said covering forms a lightweight insulation system, wherein said covering has an encapsulating nature made of a meaningfully airtight fabric having at least one contiguous metallised layer on the inward facing side thereof, surrounding an inner tent comprising of a similar airtight fabric and said frame, thereby providing a meaningfully airtight space between said inner tent and said covering, such that said space forms a non-pneumatic thermal envelope, so that the movement of heat into and or out of said inner tent is impeded.

2. [0190] The tent of claim 1 wherein said airtight fabric of said inner tent and said covering having a deposition of vaporised metal adhered to one side thereof, such that said vaporized metal of said inner tent fabric and said fabric covering are deposited analogous to one another at a predetermined distance, whereby the movement of heat into and or out of said inner tent is further impeded.

3. [0191] The tent of claim 1 wherein said fabric panels and said covering is comprised of polyester, polyethylene naphthalate, nylon, polyethylene, polyurethane, natural fibers such as silk, jute, cotton, hemp, blends of natural and synthetic fibers or non-woven materials such as CTF3, polypropylene, polyimide or polyolefin.

4. [0192] The tent of claim 1 wherein said metalised layer is comprised of an ultrathin silicone film, polyamide, polyethylene terephthalate, ethylene vinyl alcohol, high-density polyethylene, polyethylene naphthalate, polypropylene, polycarbonate, polyimide, polyvinyl fluoride, polyolefin, or a thin fabric

substrate comprising of nylon, polyester, polyethylene naphthalate, polyethylene or cotton, wherein a vaporised metal is deposited to at least one side thereof.

5. [0193] The metalised layer of claim 1 whereby at least one said layer is suspended between said inner tent and said covering, such that said thermal envelope is separated into a plurality of subdivisions, whereby improving the intrinsic insulating properties thereof.

6. [0194] The tent of claim 1 wherein at least a predetermined amount of said covering is comprised of a highly vapour-permeable material, further including said inner tent fabric having inherent vapour permeable properties, whereby providing said thermal envelope with a substantially high vapour transmission rate, such that vapour and liquid moisture is removed through said thermal envelope without interfering with the airtight nature or thermal properties thereof.

7. [0195] The tent of claim 1 further including a skylight comprising of a transparent material and a frame with means for suspending said skylight above said covering, wherein said covering has an opening at the apex thereof, whereby said opening forms part of a ventilation system further including indicium means for adjusting illumination and fresh air from within said inner tent.

8. [0196] The tent of claim 1 wherein said fabric is colourised with a carbon black dye, whereby said dye behaves as a small thermal absorber.

9. [0197] A shelter of the type comprising fabric walls, a floor, and a fabric covering, characterized in that said covering surrounds said walls and joins with said floor, to form a single article having minimal openings for the insertion of a frame, wherein at least a single metalised layer is contiguous to said walls and said covering, whereby depositing said metalised layer within a space formed between said walls and said covering, the aggregate improvement of which provides said shelter with a lightweight and non-pneumatic insulation system that retards the movement of heat, such that said insulation system functions more as a thermal reservoir rather than as a simple reflector of said heat.

10. [0198] The shelter of claim 9 wherein said fabric is comprised of a meaningfully airtight polyester, polyethylene naphthalate, nylon, polyethylene, polyurethane, natural fibers such as silk, jute, cotton, hemp, blends of natural and synthetic fibers or non-woven materials such as CTF3, polypropylene, polyimide or polyolefin.

11. [0199] The shelter of claim 9 wherein said metalised layer is comprised of an ultrathin silicone film, polyamide, polyethylene terephthalate, ethylene vinyl alcohol, high-density polyethylene, polyethylene naphthalate, polypropylene, polycarbonate, polyimide, polyvinyl fluoride, polyolefin, or a thin fabric substrate comprising of nylon, polyester, polyethylene naphthalate, polyethylene or cotton, wherein a vaporised metal is deposited to at least one side thereof.

12. [0200] The metalised layer of claim 9 whereby at least one said layer is suspended between said walls and said covering, such that said thermal reservoir is separated into a plurality of discreet subdivisions, whereby improving, to a predetermined degree, the inherent insulating properties of said shelter.

13. [0201] The shelter of claim 9 wherein said fabric is comprised at least in part of a highly vapour permeable material, providing said shelter with a higher vapour transmission rate, whereby moisture vapour is removed beyond the periphery of said covering without interfering with the functioning of said insulation system.

14. [0202] A method of insulating a shelter, comprising:

(a) [0203] providing an insulator of the type comprising a covering made of a meaningfully airtight fabric having a contiguous metalised layer to the underside thereof, an inner tent surrounded by said covering, comprising of said fabric and a frame,

(b) [0204] providing first means for marrying said covering to said inner tent, such that a meaningfully airtight space is formed between said covering and said inner tent,

(c) [0205] providing at least one said metalised layer second means for being suspended from said covering, such that said airtight space is separated into smaller divisions, whereby increasing the insulating properties of said space,

(d) [0206] having an opening into said inner tent to permit a human being entrance into said shelter and third means for closing thereof,

(e) [0207] providing fourth means for removing moisture vapour from said human being, wherein said fabric is comprised at least in part of a highly vapour permeable material, whereby moisture vapour is defused through said airtight space into a surrounding outdoor environment,

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(f) [0208] providing fifth means for ventilation of said shelter, such that fresh air can circulate inside said inner tent without interfering with said airtight space,

[0209] whereby said insulator provides a reliable, lightweight and versatile way to thermally protect said human being from said environment, by effectively obstructing the movement of heat into and or out of said shelter.

15. [0210] The method of claim 14 wherein said fabric is comprised of a meaningfully airtight polyester, polyethylene naphthalate, nylon, polyethylene, polyurethane, natural fibers such as silk, jute, cotton, hemp, blends of natural and synthetic fibers or non-woven materials such as CTF3, polypropylene, polyimide or polyolefin.

16. [0211] The method of claim 14 wherein said metalised layer is comprised of an ultrathin silicone film, polyamide, polyethylene terephthalate, ethylene vinyl alcohol, high-density polyethylene, polyethylene naphthalate, polypropylene, polycarbonate, polyimide, polyvinyl fluoride, polyolefin, or a thin fabric substrate comprising of nylon, polyester, polyethylene naphthalate, polyethylene or cotton, wherein a vaporised metal is deposited to at least one side thereof.

17. [0212] A tent comprising of an airtight fabric covering having a deposition of vaporised metal adhered to the underside thereof, surrounding an inner tent comprising of said fabric having said vaporized metal on the outward facing side thereof, such that said fabric, with contiguous said vaporised metal, is deposited analogous to one another, at a predetermined distance, afforded by the support of a frame, whereby the vaporised metal side of said fabrics are contained within a meaningfully airtight space, the improvement wherein said airtight space with said analogous vaporized metal on the interior surfaces thereof, having augmented thermal insulating properties, whereby the movement of heat into and or out of said inner tent is impeded.

18. [0213] The tent of claim 17 wherein said fabric is comprised of a meaningfully airtight polyester, polyethylene naphthalate, nylon, polyethylene, polyurethane, natural fibers such as silk, jute, cotton, hemp, blends of natural and synthetic fibers or non-woven materials such as CTF3, polypropylene, polyimide or polyolefin.

19. [0214] The tent of claim 17 wherein said fabric is comprised at least in part of a highly vapour permeable material, providing said shelter with a high vapour transmission rate, whereby moisture vapour is removed from said inner tent without interfering with the functioning of said airtight space.

20. [0215] The tent of claim 17 wherein said airtight space having at least one additional layer of a vapour permeable material, suspended between said inner tent and said covering, such that said airtight space is separated into a plurality of subdivisions, whereby enhancing the intrinsic properties of the air within.

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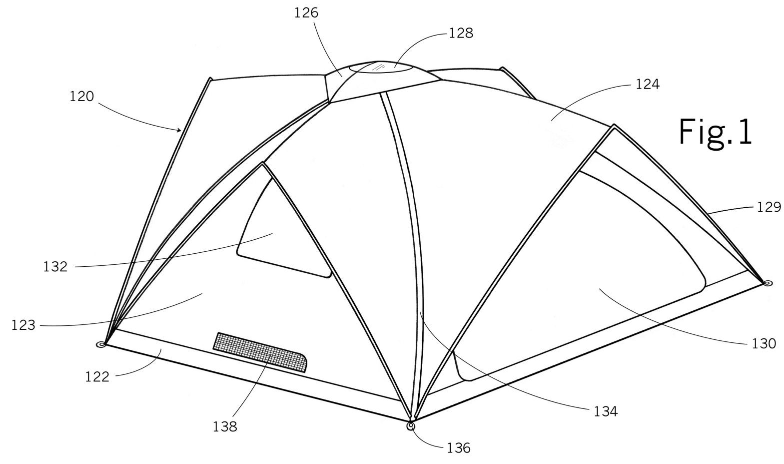

Fig.1

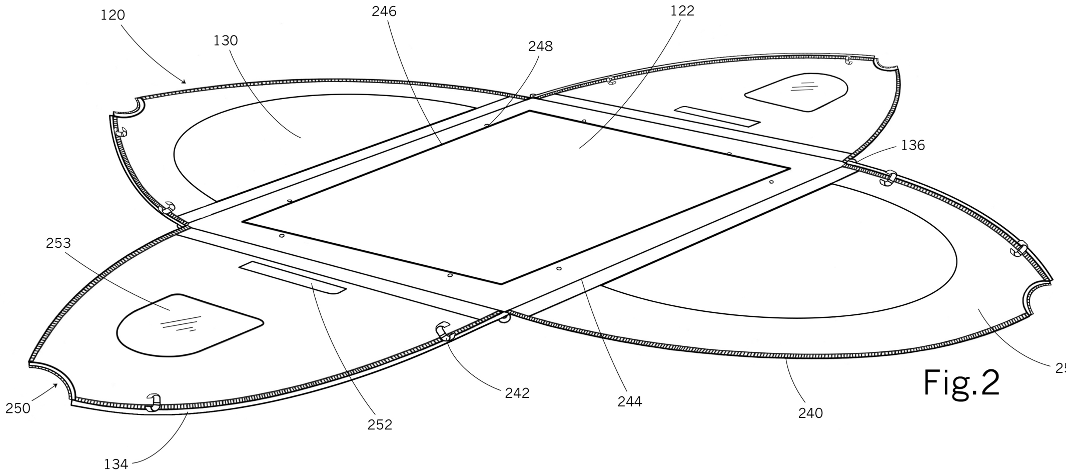

Fig.2

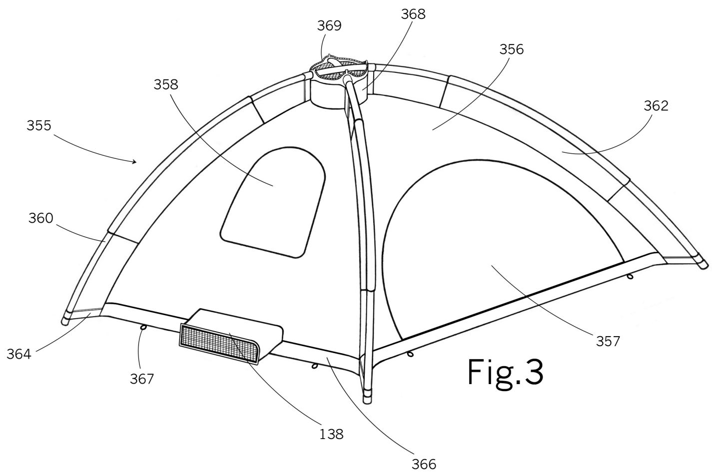

Fig.3

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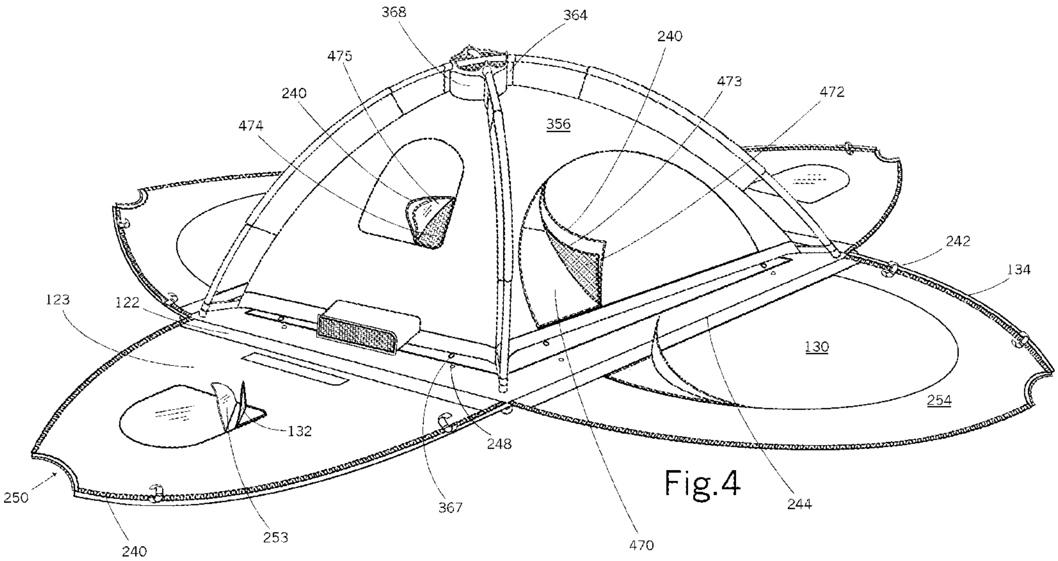

Fig.4

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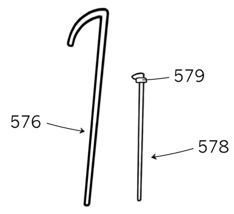

Fig.5

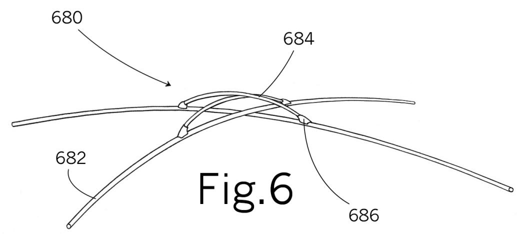

Fig.6

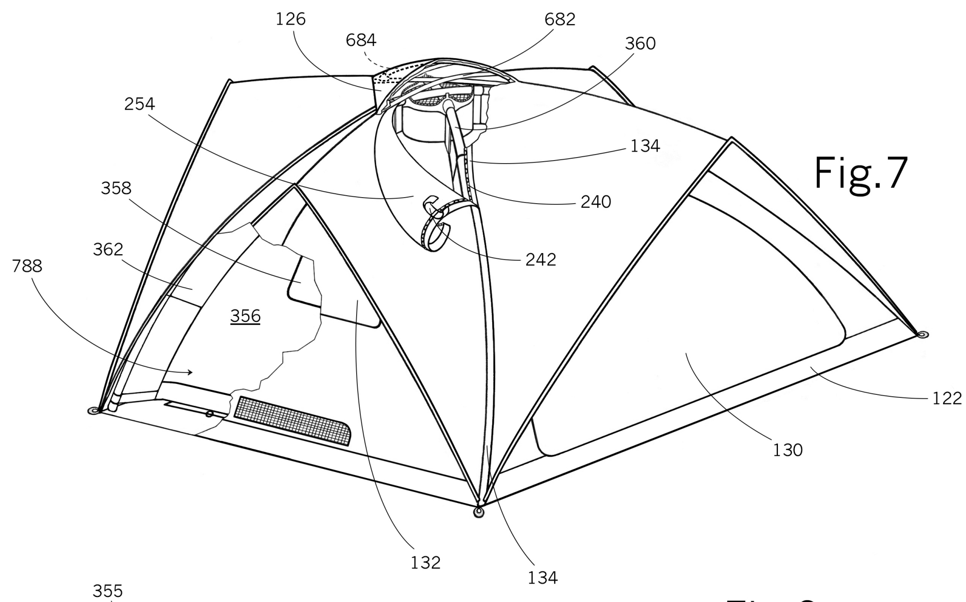

Fig.7

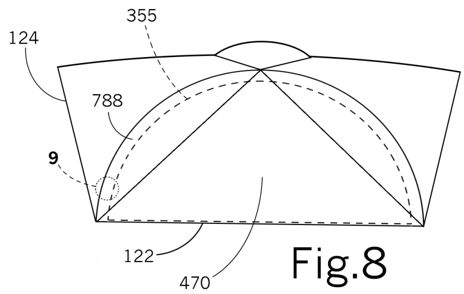

Fig.8

Fig.9

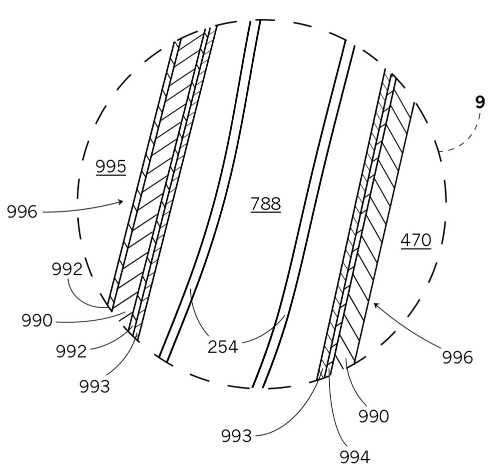

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Fig.10a

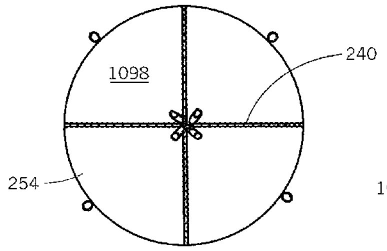


Fig.10b

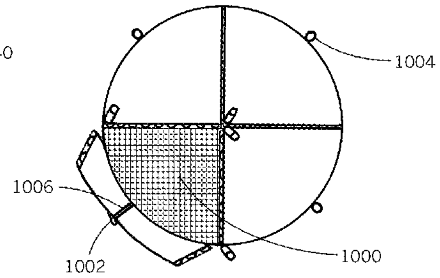


Fig.10c

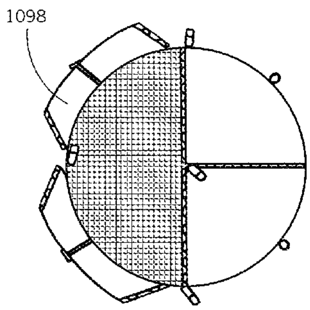


Fig.10d

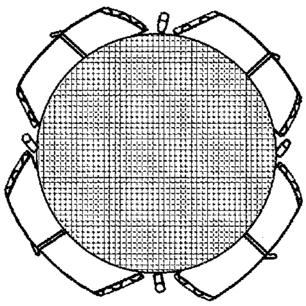
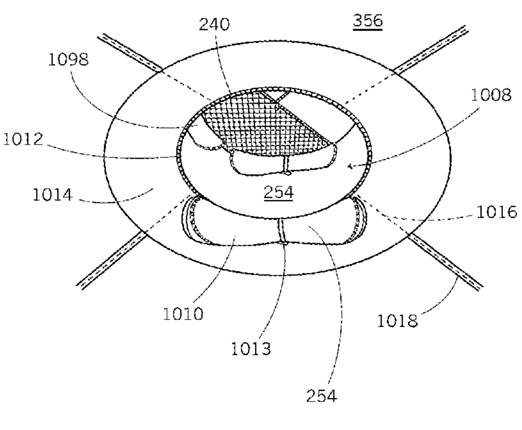


Fig.10e



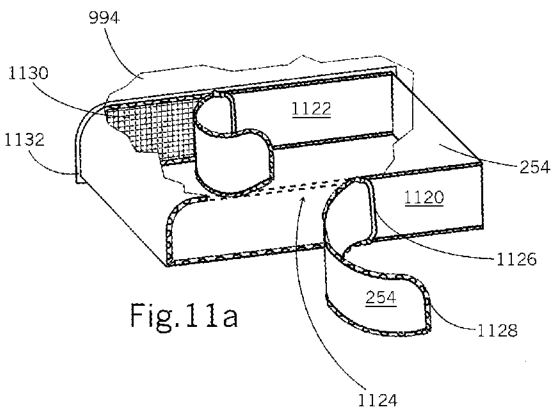


Fig.11a

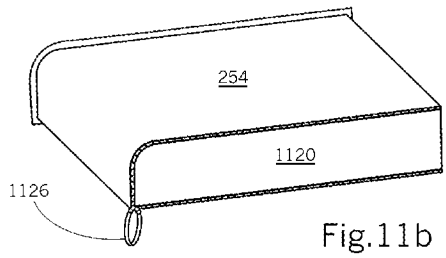


Fig.11b

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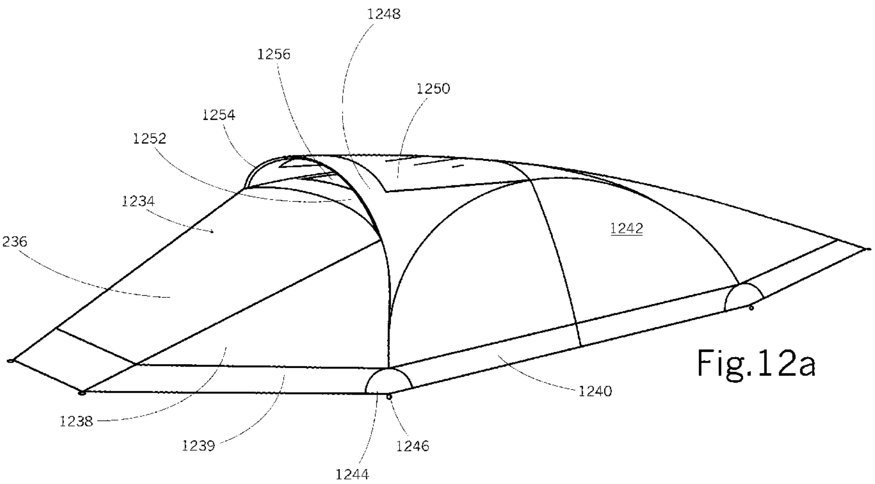

Fig.12a

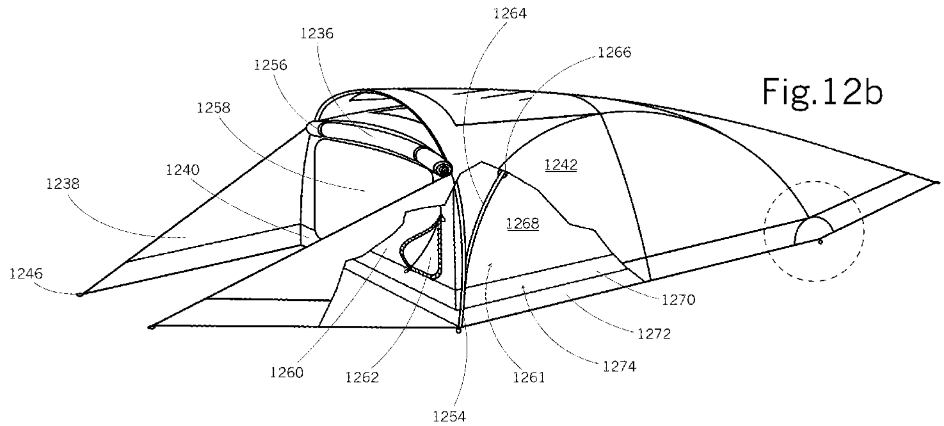

Fig.12b

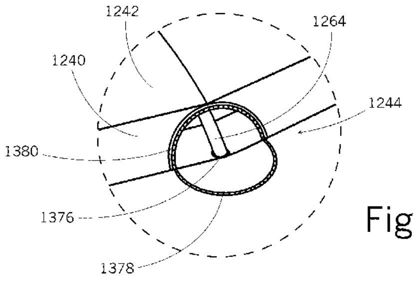

Fig.13