July 29, 1969 C. P. WOOD, JR 3,457,684

SELF-SUPPORTING INFLATABLE SHELTER

Filed Jan. 10, 1967 3 Sheets-Sheet 1

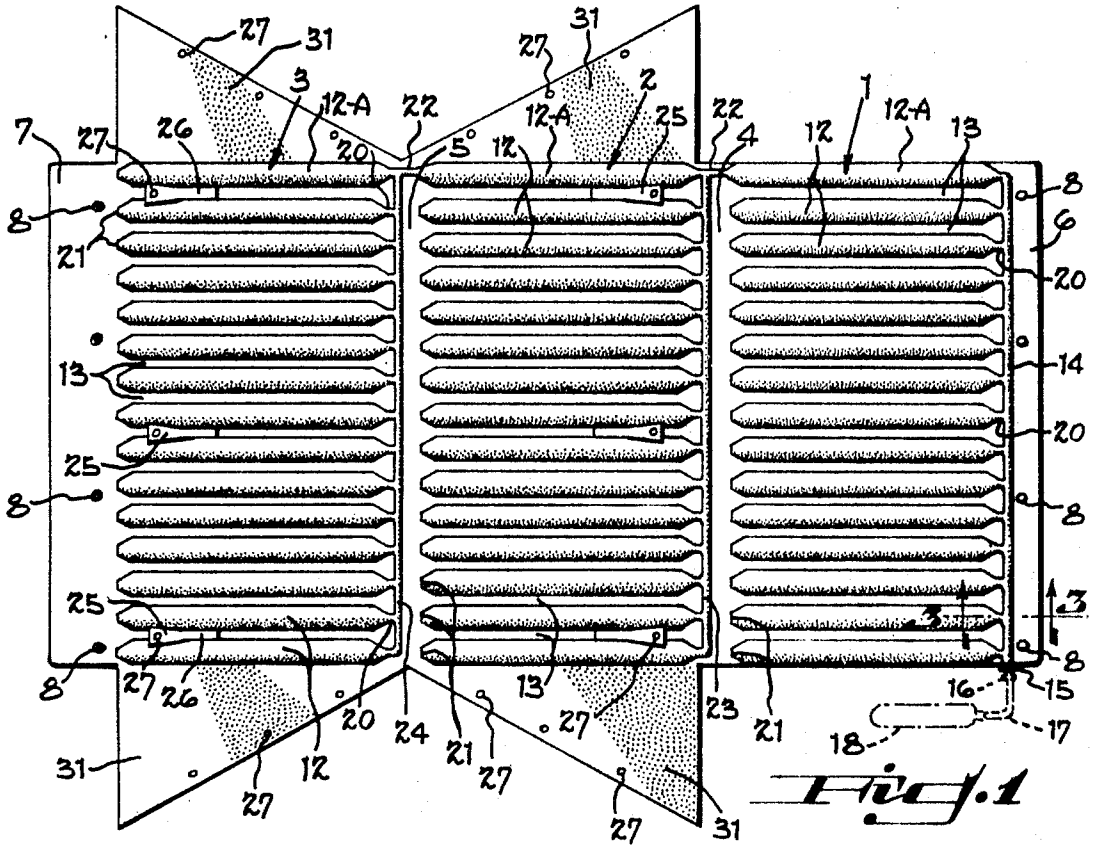


Fig. 1

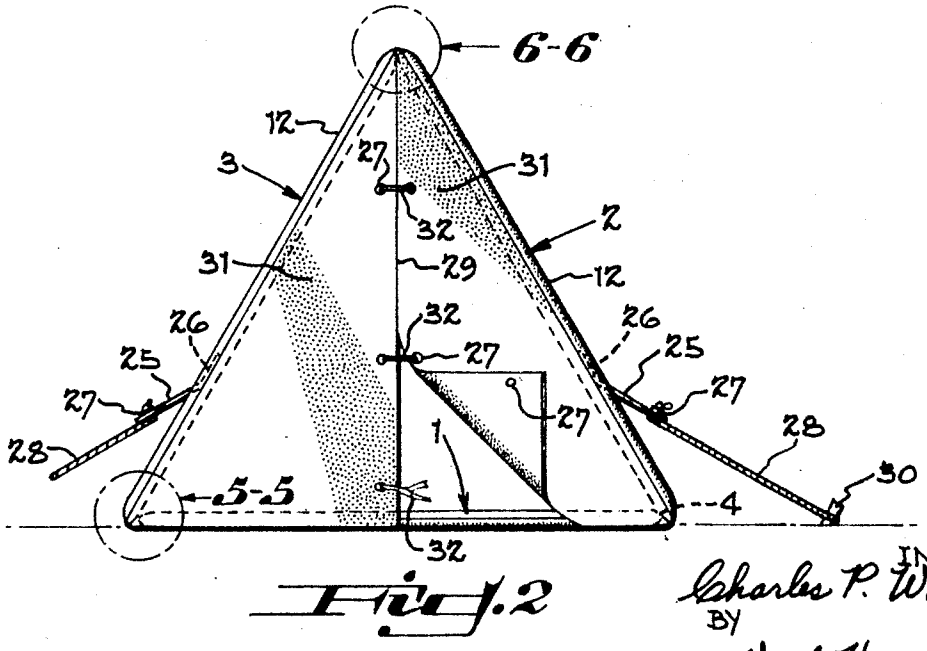


Fig. 2

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SELF-SUPPORTING INFLATABLE SHELTER

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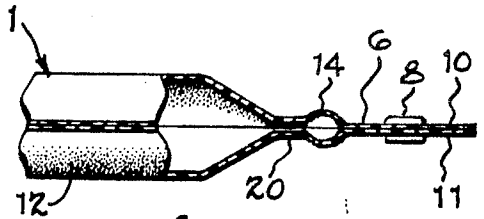


Fig. 3

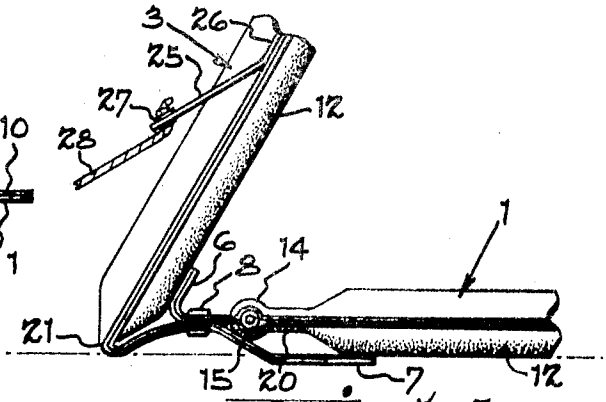


Fig. 5

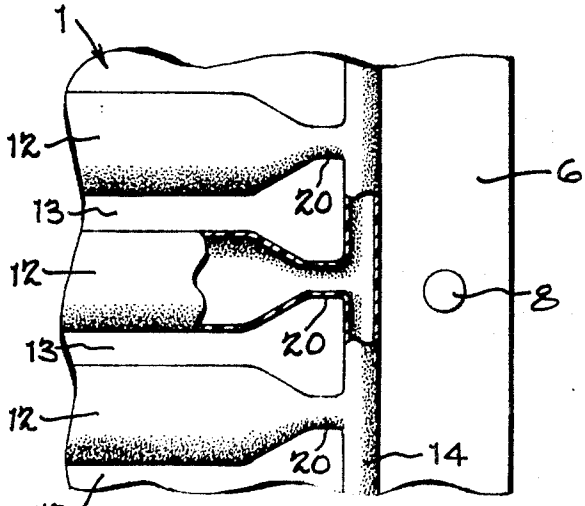


Fig. 4

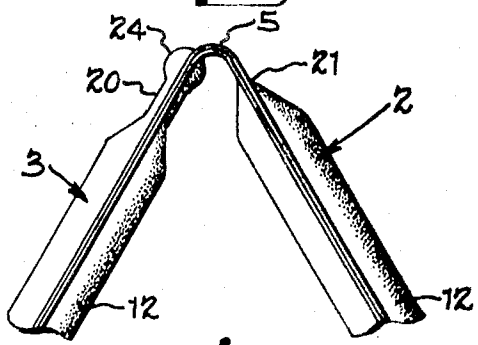


Fig. 6

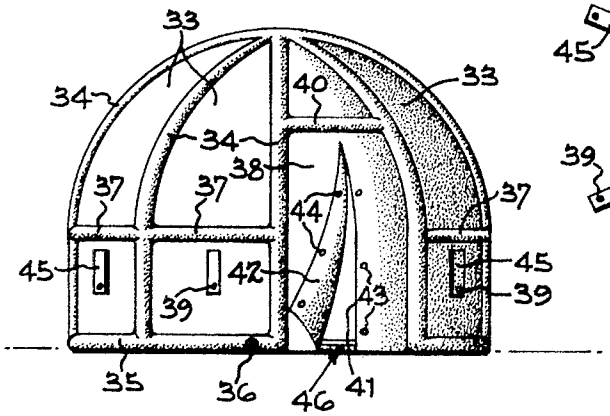


Fig. 7

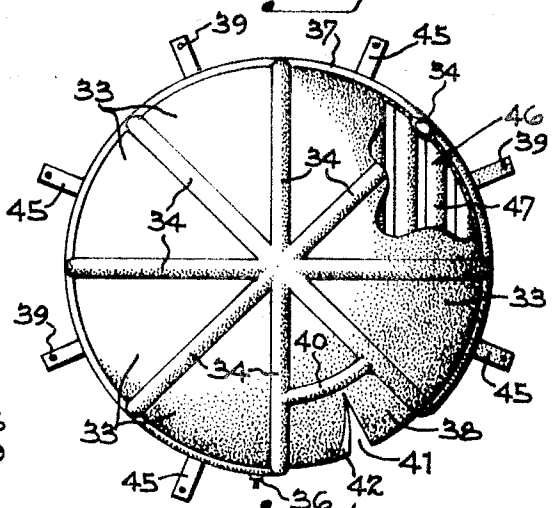


Fig. 8

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SELF-SUPPORTING INFLATABLE SHELTER

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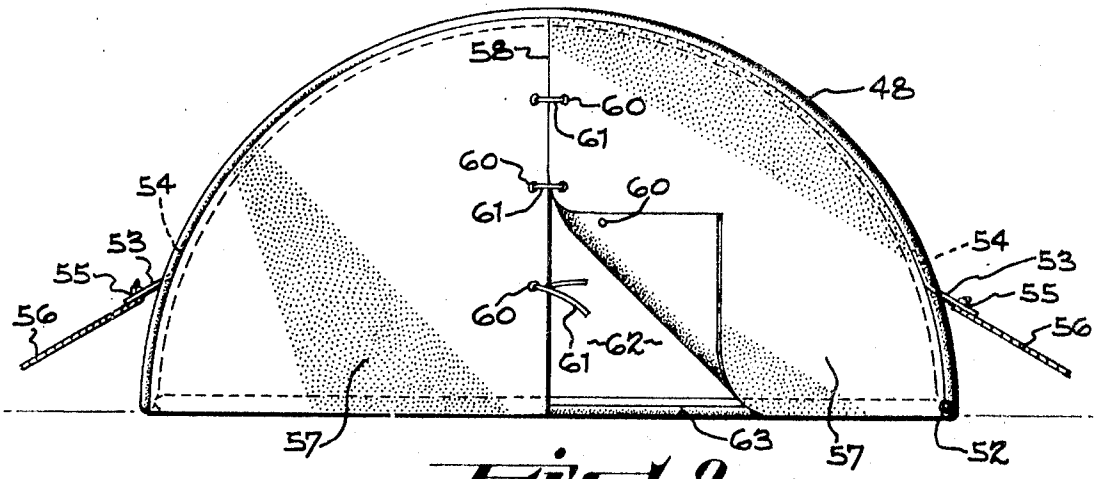


Fig. 9

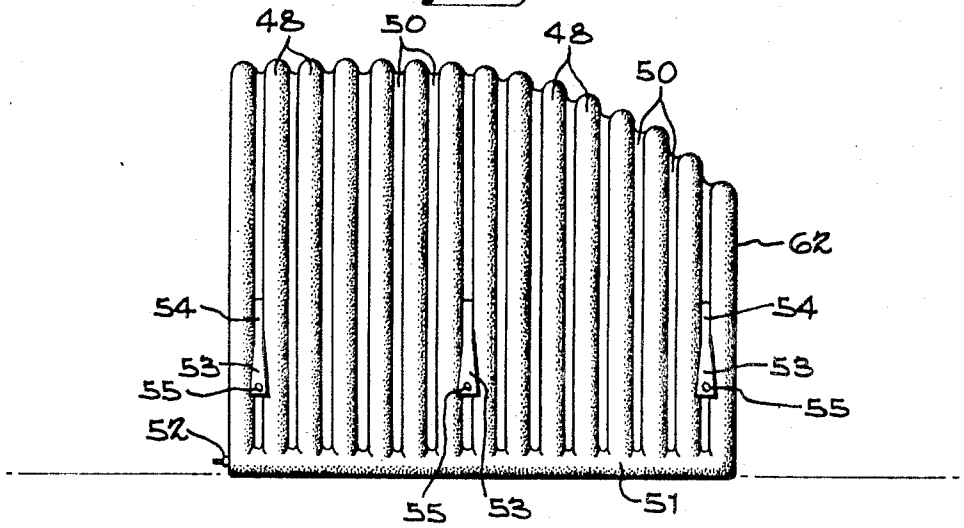


Fig. 10

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3,457,684

SELF-SUPPORTING INFLATABLE SHELTER

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U.S. Cl. 52—2 3 Claims

ABSTRACT OF THE DISCLOSURE

The following disclosure is directed to inflatable shelters consisting of sheets or films fabricated from pliable material providing the roof of the shelter with inflatable tubular cells or ribs arranged in load-supporting relationship to the pliable sheets. The inflatable cells are connected in common with a manifold which includes an inlet-outlet valve, the arrangement being such that the shelter may be collapsed to a compact package by deflating the tubular cells by way of the valve or erected at the point of use by the application of air or gas pressure to the inlet-outlet valve.

This invention relates to inflatable, prefabricated shelters or tents for outdoor use by campers, hunters, or for military use in the field.

One of the primary objects of the invention has been to provide a shelter which requires no poles or other rigid supports; which forms a lightweight compact package for transport; and which is erected in a convenient manner by the use of a pump or by bottled gas or air.

According to this concept, the elimination of poles or other rigid support members provides a more compact, easily transportable package; moreover, the self-erecting feature eliminates the work of erecting conventional rigid supporting members and provides a shelter which is erected very quickly and with very little effort.

Another object of the invention has been to provide a shelter which is of simple low cost fabrication, utilizing beam-like air cells which extend in load-supporting relationship to the walls of the shelter, and in which the shelter is fabricated from low cost materials in an inexpensive rapid manner, for example, by the use of dies.

According to this aspect of the invention, the shelter is fabricated from two films or sheets of plastic material in face-to-face relationship, the two sheets being joined together along parallel seal lines delineating parallel air cells which form the supporting beams. In the preferred embodiment, the plies or films are of the thermoplastic type which may be fused or welded by heat along the seal lines by the use of suitable dies or other heat sealing means. However, if desired, the plastic film plies may consist of other types of sheet material, plastic or otherwise, in which case the seal lines may be formed with the use of a suitable adhesive material.

A further objective of the invention has been to provide a prefabricated, inflatable shelter or tent which is of one-piece, composite construction, including a floor in the form of an air mattress having inflated ribs forming an integral part of the shelter and inflatable with the side walls of the tent by means of a single inlet-outlet valve.

In a shelter embodying this feature, the shelter is in the form of a typical triangular tent having upwardly sloping side walls joined together at their apex, with the air mattress floor hingedly joined to one of the side walls. In erecting the shelter, the collapsed package is placed on the ground in a flattened condition, then the air or gas pressure is applied to the inlet-outlet nozzle which communicates with the air cells of the floor or air mattress, as well as the air cells of the sloping side walls. The air cells

of the side walls, which form the supporting beams, extend upwardly, and transversely, that is, from the lower edges of the side walls upwardly to the apex of the tent so as to form relatively rigid beams which not only erect the side walls but support them. The modified forms of the invention disclosed herein also use the principles of longitudinal air cells in parallel relationship extending upwardly and transversely from the lower edges of the shelter and across the top of the opposite lower edges, thereby to act as rigid supporting beams.

The various features and advantages of the invention will be more clearly apparent to those skilled in the art from the following detailed description taken in conjunction with the drawings.

In the drawings:

FIGURE 1 is a developed view, illustrating a tent-type shelter, with the transverse beam-like tubular cells or ribs in inflated condition prior to the erection of the shelter.

FIGURE 2 is a front view of the shelter illustrated in FIGURE 1, with the inflated shelter in erected condition.

FIGURE 3 is an enlarged fragmentary sectional view taken along the line 3—3 of FIGURE 1, detailing the manifold and one of the tubular inflatable cells of the shelter.

FIGURE 4 is an enlarged fragmentary top plan view, as projected from FIGURE 3, further illustrating the manifold and connected cells of the shelter.

FIGURE 5 is an enlarged fragmentary front view, with the flap removed, taken from FIGURE 2, as indicated at 5—5 by the circle in broken lines, illustrating the snap fastener connection between the floor and side wall of the erected tent.

FIGURE 6 is an enlarged fragmentary view with the flap removed, also taken from FIGURE 2, as indicated at 6—6 by the circle in broken lines, illustrating the flexible hinge connection at the apex of the tent-type shelter after erection.

FIGURE 7 is a front elevation illustrating an igloo or dome-shaped shelter as a modified form, utilizing the principles of the present invention.

FIGURE 8 is a top plan view of the modified shelter shown in FIGURE 7, further illustrating the structure.

FIGURE 9 is a front elevation illustrating a further modification of a shelter constructed according to the principles of the invention, in which the shelter is in the form of a Quonset hut having a semicircular arching roof supported by transversely extending, inflated tubular cells which act as support beams.

FIGURE 10 is a side elevation, further illustrating the structure shown in FIGURE 9.

TENT-STYLE SHELTER

The prefabricated, collapsible tent-type shelter illustrated in FIGURES 1–6, essentially comprises a floor panel indicated generally at **1**, and a pair of side wall panels indicated generally at **2** and **3** forming a composite unit. As best shown in FIGURE 1, the floor and the two side wall panels preferably are of one-piece construction, the side wall panel **2** being joined to the floor panel **1** along the hinge section **4**, and the side wall section **3** being joined to the side wall section **2** along the hinge line **5**. The hinge line **5** forms the apex or ridge pole of the tent, as shown in FIGURE 6.

One edge portion of the composite floor panel **1** is provided with a marginal connecting flap **6**, and the outer edge portion of the side wall panel **3** includes a mating marginal flap **7**. When the floor and wall panels are erected, as shown in FIGURE 5, the mating marginal flaps **6** and **7** are secured together by snap fasteners or other means, as indicated generally at **8**.

The side wall panels **2** and **3** and the floor panel **1**, as a

composite structure, each comprise in the present example, two plies, preferably formed of a thermoplastic material, that is, thin plies of plastic material, such as vinyl resin, which is capable of being joined or fused by the application of the heat. However, if desired, the film may comprise other types of flexible, air-impermeable material the films being secured together in the necessary areas by a suitable adhesive.

In the tent-style shelter, illustrated in FIGURES 1–6, the two plies of plastic film are indicated at **10** and **11** (FIGURE 3). The two plies **10** and **11**, in the present example, consist of two one-piece sheets, shaped and sealed to provide the parallel tubular cells **12**, which form a part of the floor panel **1** and the side wall panels **2** and **3** of the tent. The air cells (which are inflated by air or gas under pressure) impart sufficient stiffness to the side wall panels **2** and **3** to support the side walls when the tent is erected as shown in FIGURE 2. The air cells **12** may be omitted from the floor panel **1** if desired; however, in the present example, which represents a relatively small tent for camping, the floor panel **1** is intended to serve as an air mattress.

In fabricating the tent, according to the present example, the tubular cells **12** are delineated by the heat seal or weld lines indicated at **13** (FIGURES 1 and 4), which extend parallel with one another and delineate the tubular cells **12**. When the tent is formed from thermoplastic film (as noted above), the two sheets of plastic **10** and **11** may be placed between suitable heated dies which provide the necessary design to heat seal the areas **13**, which delineate the air cells and also the marginal connecting flaps **6** and **7**.

In the present example (FIGURES 1–6), as well as in the modified forms of the invention, the tubular cells **12**, which act as stiffening beams or ribs for the side wall panels **2** and **3**, extend parallel with one another and in the slope direction of the wall panels in the erected position of the tent. In other words, the inflated air cells or ribs **12** impart sufficient stiffness to the wall panels to support the wall panels rigidly under pressure.

To permit inflation of the air cells **12** at the campsite, the shelter includes a first manifold **14** (FIGURES 1, 3 and 4) formed along the marginal connecting flap **6**. The manifold **14** includes an inlet-outlet valve **15** (FIGURES 1 and 5) arranged for connection with the outlet nozzle **16** of a hose **17** (FIGURE 1). The hose **17** communicates with a bottle **18** (or air pump) containing compressed air or bottled gas which is available commercially. The inlet valve **15** acts as an outlet valve when it is desired to deflate the tent in order to collapse and package it.

In order to inflate the air cells of the floor panel **1** and the side wall panels **2** and **3** concurrently, the air cells **12** of the three panels are interconnected (FIGURE 1). For this purpose, the first manifold **14** includes necked passageways **20** (FIGURES 3 and 4) in communication between manifold **14** and the end of each air cell **12** of the floor panel. The air cells of the floor panel, opposite the manifold **14** are sealed off as at **21** (FIGURES 1 and 5) so as to delineate the flexible hinge section **4**, previously noted.

The ends of the air cells **12** of the side wall panels **2** and **3** are similarly sealed off as at **21** (FIGURE 1). However, in order to interconnect the sets of air cells of the three panels, one air cell of each panel, indicated at **12–A** (FIGURE 1), includes a passageway **22**. The passageways **22** communicate with manifolds **23** and **24** located along the hinge lines **4** and **5** of the side walls. The manifolds **23** and **24** include passageways **20**, as described above, which communicate with the ends of the air cells **12** of the side wall panels **2** and **3**. By virtue of this arrangement, the air cells **12** of the floor panel **1** and the side wall panels **2** and **3** are inflated concurrently by way of the inlet-outlet valve **15** and are similarly deflated by way of valve **15**.

As shown in FIGURE 2, the tent-style shelter is self-contained and entirely self-supporting when erected. However, in order to anchor the tent firmly in place, it may be provided with anchor straps **25** (FIGURES 1 and 2) secured to the side wall panels **2** and **3**. The straps **25** may be formed of a flexible plastic material similar to the sheets from which the tent is fabricated. The anchor straps **25** each include an end portion **26** which is secured by heat sealing or adhesive to the superimposed plastic sheets along the seal lines **13**.

Each anchor strap includes a metal grommet or eyelet **26** (FIGURES 1, 2 and 5). Guy ropes **28**, one for each of the anchor straps **25**, pass through the grommets and are knotted in the usual way. Upon erection of the tent (FIGURE 2), stakes **30**, one for each guy rope **28**, are driven into the ground in the usual way to anchor the free ends of the guy ropes **28**.

The opposite ends of the side wall panels **2** and **3** each include a triangular, door flap panel **31** of conventional design (FIGURES 1 and 2). These flaps are formed by extensions of the sheets of plastic film **10** and **11**, the film being joined by heat sealing, as explained above, or by adhesive. The free edge portion of each door flap panel **31** includes spaced eyelets or grommets **27** similar to those previously described with reference to the anchor straps **25**.

When the tent is erected, the pairs of door panel flaps **31** complement one another in meeting or overlapping relationship along the line **29**. In order to secure the closure, tie bands **32** may be passed through the grommets **27** in the usual way, as shown in FIGURE 2.

ERECTION

In erecting the tent-style shelter, the floor panel **1** and the side wall panels **2** and **3** are spread upon the ground, as shown generally in FIGURE 1. The tent may be erected by either folding the floor panel **1** and wall panels **2** and **3** securing them together by means of the snap fasteners, previously indicated at **8**, before inflation. However, it may be more convenient to inflate the panels at this stage, than to erect the side wall panels **2** and **3** with respect to the floor panel **1**. In either event, the floor panel **1** is folded inwardly with respect to the side wall panels from the extended position shown in FIGURE 1, such that the floor panel **1** is pivoted along the hinge line **4**. At this stage of erection, the marginal connecting flap **6** of the floor panel **1** overlies the marginal flap **7** of the side wall panel **3**, as shown in FIGURE 5. The mating snap fasteners **8** of the two marginal flaps are then engaged with one another, thus completing the election procedure.

The snap fasteners **8** are of the well known type comprising mating ball and socket elements, the two elements being placed one against the other then forced together to provide a snap fit. It will be understood that other types of fastening means may be provided, the snap fasteners **8** being selected as a typical example.

DOME-SHAPED SHELTER

The structure illustrated in FIGURES 7 and 8 represents a prefabricated, collapsible shelter in the form of an igloo or dome, utilizing tubular air cells in the form of arches which extend radially from the center of the shelter to the ground level. This shelter is also intended to be inflated conventiently by air or gas pressure at the site of erection. The dome-style shelter preferably is of one-piece construction, comprising two plies of a thermoplastic film or other type of flexible, air-impermeable material, as noted earlier with respect to FIGURES 1–6.

As shown in FIGURES 7 and 8, the dome-style shelter comprises sector-shaped panels **33** delineated by the radial air cells or arches **34**, which, when inflated under air or gas pressure, act as rigid support beams. The air cells **34** communicate with a circular manifold **35**, which extends around the base of the shelter, and which communicates with the lower ends of the arched air cells **34**. An inlet-outlet valve **36**, arranged for connection with the outlet nozzle of an air pump or pressure vessel, such as the

bottle **18** of compressed air or gas, as described earlier with reference to FIGURE 1.

In order to expand the shelter to its dome shape, that is, to stretch the sector-shaped panels **33** between the radial air cells **34**, the structure includes a series of peripheral air cells **37** extending horizontally between the arched vertical air cells **34** and in communication therewith. The peripheral air cells **37** are formed in the same manner as the arched air cells **34** and force the arched air cells apart from one another, upon inflation, thus stretching the panels **33** to their sector configuration.

In the embodiment illustrated (FIGURES 7 and 8) the shelter is provided with a flap panel **38**, disposed between two of the arched air cells **34**, the upper edge of the panel **38** being delineated by a peripheral air cell **40**. The panel **38** includes an opening **41** having a tent flap **42**. The panel **38** alongside the opening **41** includes snap fasteners **43** and the edge portion of the flap **42** includes mating snap fasteners **44** of conventional design.

The igloo-type shelter includes anchor straps **45**, including grommets **39** for connection with guy ropes (now shown), similar to the guy ropes **28** which are anchored to the stakes **30**, as shown in FIGURE 2. As shown in FIGURE 8, the anchor straps **45** extend radially from the periphery of the shelter upon erection.

As shown in FIGURE 8, the modified form of the shelter may include a composite floor panel **46** having air cells **47**, as described earlier with reference to FIGURE 1. The air cells **47** preferably are interconnected with a manifold (not shown) having an inlet-outlet valve as described earlier.

ARCH-TYPE SHELTER

The second modified version of the invention, shown in FIGURES 9 and 10, is of the type having an arched roof of the Quonset type. The construction of this shelter follows that previously described, utilizing two films of thermoplastic material. As best shown in FIGURE 10, the shelter comprises parallel tubular air cells in the form of arches **48** which are delineated by seal line areas **50**. The lower portion, along at least one side of the shelter, is provided with a manifold **51** communicating with the lower ends of the arch air cells **48**, as noted earlier with reference to the other forms of the invention. The end of manifold **51** includes an inlet-outlet valve **52** arranged to receive the nozzle of a compressed gas or air bottle (not shown) for erecting the shelter from its collapsed condition.

The shelter may include the series of anchor straps **53** having end portions **54** secured by heat sealing or adhesive to the seal areas **50** between the arched air cells **48**. The free end portions of the anchor straps **53** include grommets **55** for the reception of the guy ropes **56** for anchoring the shelter, as described earlier.

The front of the arched shelter is provided with flaps **57–57** which form a part of the arched roof. The mating edges **58** of the flaps **57** are provided with grommets **60** for the reception of tie bands **61**, by means of which the flaps are held in closed position.

The rearward end of the shelter, as indicated at **62**, includes closure flaps similar to flaps **57**. In addition, the shelter may include a floor panel **63**, of the type indicated at **1** in FIGURE 1, including, if desired, air cells, as described earlier. The floor panel **63** may form an integral part of the shelter with its air cells communicating with the manifold **51**. On the other hand, the floor panel may be furnished as a separate item to be inflated with its own inlet-outlet valve.

Having described the invention, I claim:

1. A self-supporting inflatable shelter of triangular tent-style configuration, said shelter adapted to be collapsed to a compact package upon being deflated, said self-supporting inflatable shelter comprising:

a pair of side wall panels inclined upwardly from a base to an apex;

each of said side wall panels comprised of two sheets of pliable material disposed in face-to-face relationship;

the two sheets being joined together along parallel seal lines delineating the inflatable tubular cells;

the seal lines and the inflatable tubular cells extending upwardly from the base to the apex of the shelter to form relatively rigid beams which support the side walls of the shelter;

the upper ends of the said tubular cells terminating in spaced relationship from one another at the upper portions of said pair of side walls, thereby forming a flexible hinge section which delineates the apex of the shelter;

and a manifold having an inlet-outlet valve communicating with the manifold and adapted to be connected to a source of fluid pressure;

said inflatable cells being connected in common with said manifold, whereby the inflatable tubular cells are adapted to be inflated or deflated upon applying or releasing fluid pressure by way of said inlet-outlet valve.

2. A self-supporting inflatable shelter as set forth in claim **1** in which the shelter is of triangular tent-style configuration in which there is provided a floor panel havng at least one edge joined to the lower edge of one of said side wall panels, the floor panel having a plurality of inflatable tubular cells and comprising a pair of sheets of flexible sheet material disposed in face-to-face relationship, the tubular cells being delineated by parallel seal lines facially joining and sealing the said pair of sheets relative to one another, the tubular cells of the floor panel being in communication with the tubular cells of the side wall panels, whereby the tubular cells of the floor panel are inflated or deflated concurrently with the tubular cells of the side wall panels.

3. A self-supporting inflatable shelter as set forth in claim **2** in which the edge of the floor panel which is joined to the lower edge of one of the said side wall panels includes a plurality of inflatable tubular cells, the ends of the tubular cells of the floor panel terminating in spaced relationship to the ends of the inflatable tubular cells of the side wall panel to which the floor panel is joined, thereby providing a flexible hinge section joining the edge of the floor panel to the lower edge of one side wall panel, the opposite edge of the floor panel being free of the lower edge of the second side wall panel.

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