

Nov. 3, 1959

K. E. JOY

2,910,994

INFLATABLE INCLOSURE

Filed May 8, 1957

3 Sheets-Sheet 1

Fig. 1.

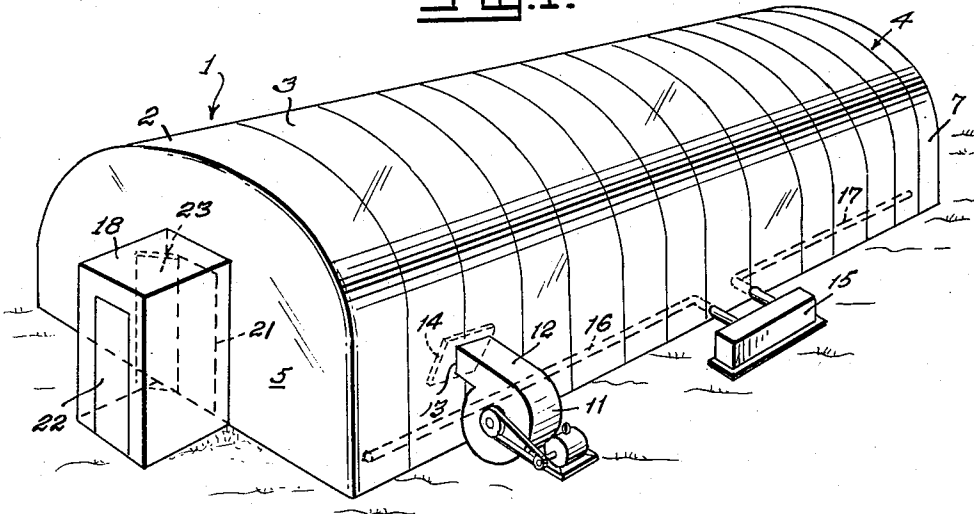


Fig. 2.

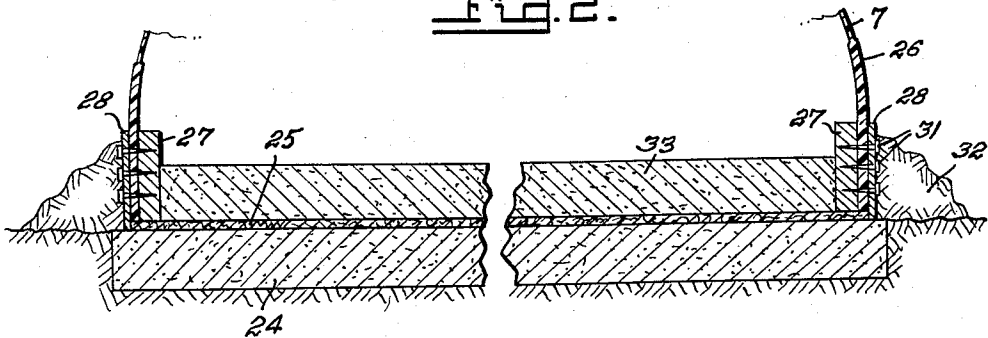
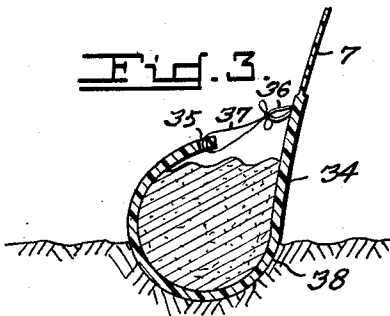


Fig. 3.



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Fig. 4.

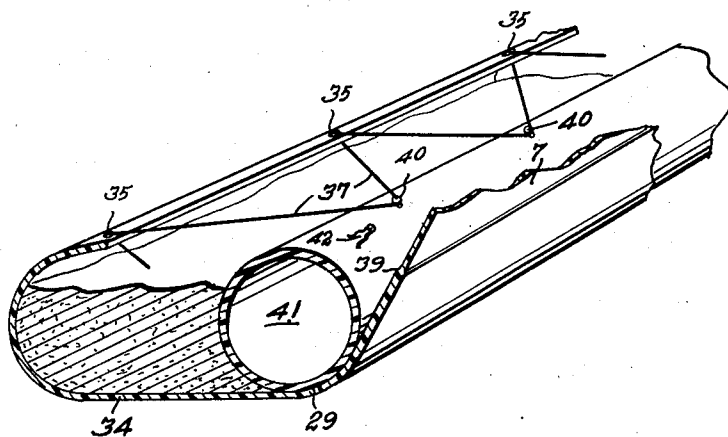


Fig. 5.

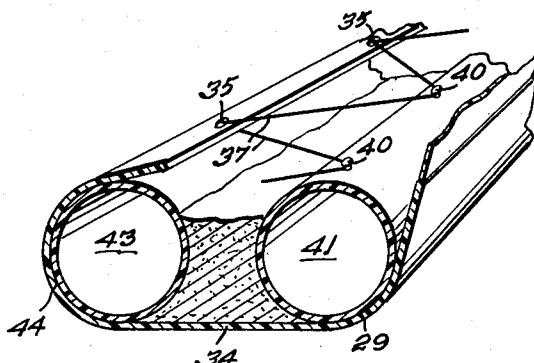
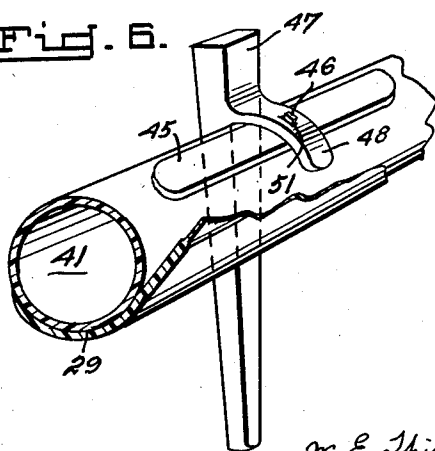


Fig. 6.



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Fig. 8

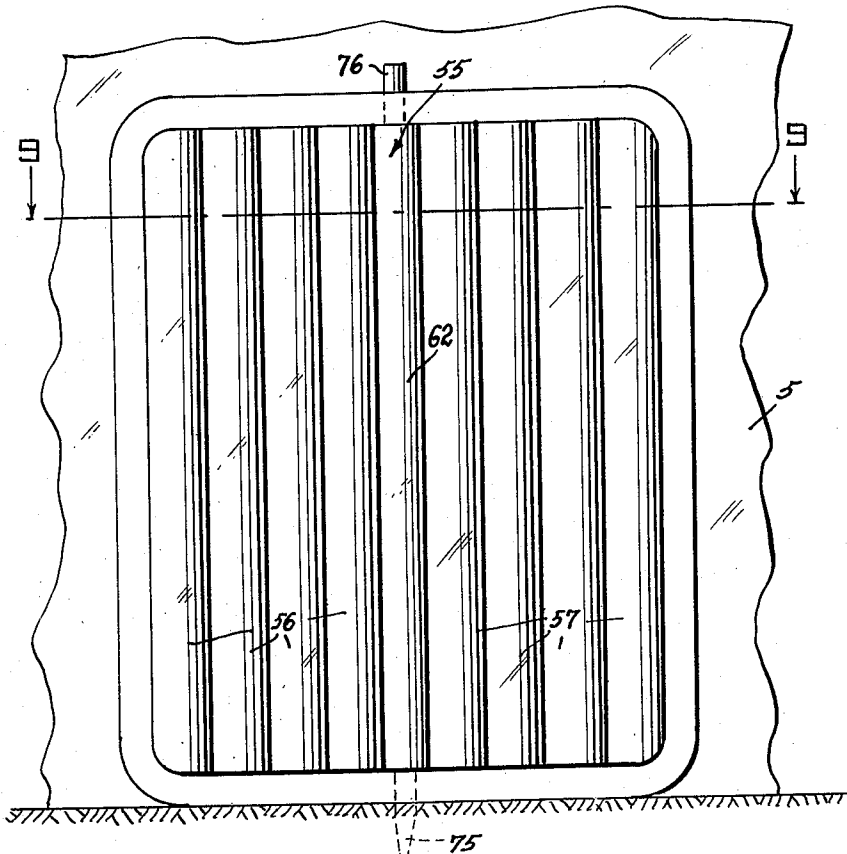


Fig. 9.

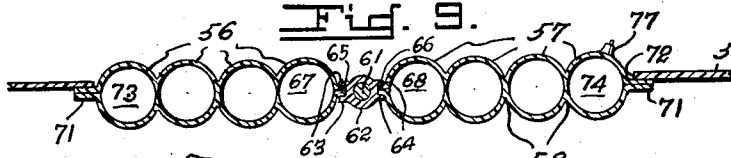


Fig. 7.

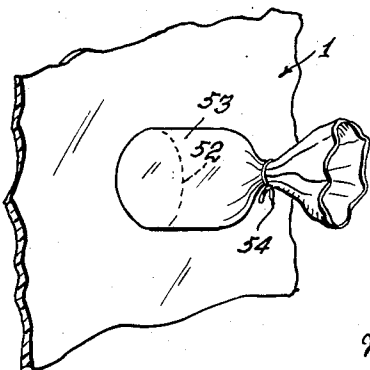
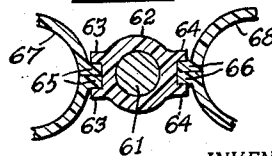


Fig. 10.



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Application May 8, 1957, Serial No. 657,988

4 Claims. (Cl. 135—1)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to improvements in inflatable hutments for use as storage enclosures or as living quarters.

The stockpiling of heavy machinery and war materiel entails the use of enormous storage areas. To prevent deterioration, shelter from weather usually must be provided, and often specially treated atmospheres are necessary, particularly an atmosphere in which the moisture content has been greatly reduced. Where storage buildings are not available, the difficulty in preventing rapid deterioration without expensive construction of suitable buildings is readily apparent. Where buildings are available for storage purposes, they may not lend themselves to the maintenance of a treated atmosphere.

Operations of armies often involve temporary movements into areas where structures suitable for housing troops are scarce or non-existent. The erection of conventional barracks and other buildings is time-consuming and expensive.

The housing of exhibits of a temporary nature presents problems of expense and waste where conventional permanent-type construction is employed.

Accordingly, it is a primary object of this invention to provide a readily transportable storage hutment.

It is a secondary object of this invention to provide a light-weight easily erectible hutment for housing troops or public exhibits.

It is an object of this invention to provide an inflatable hutment having its walls and roof formed of plastic panels.

It is another object of this invention to provide an inflatable hutment maintained erect by air pressure slightly in excess of atmospheric.

It is also an object of this invention to provide an inflatable hutment with peripheral sealing and anchoring structure contacting a floor or the ground.

It is an important object of this invention to provide an inflatable hutment with structure for utilizing earth or water in anchoring and sealing.

Yet another object of this invention is the provision in an inflatable hutment of a separately inflatable base-defining tube.

It is a further object of this invention to provide in the envelope of an inflatable hutment structure for sealing access port.

In the drawings:

Fig. 1 is a perspective view of an inflatable hutment incorporating the present invention;

Fig. 2 is a cross-sectional view of one form of sealing and anchoring structure;

Fig. 3 is a detail cross-sectional view of an apron type sealing and anchoring structure;

Fig. 4 is a combination perspective and cross-sectional view of sealing and anchoring structure employing both an apron and a contour tube;

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Fig. 5 is a combination perspective and cross-sectional view of sealing and anchoring structure utilizing an apron and two inflatable tubes;

Fig. 6 in a combination perspective and cross-sectional view of sealing an anchoring structure utilizing a contour tube and stake;

Fig. 7 is a perspective view of a port sealing structure;

Fig. 8 is an elevational view of an inflatable port closure;

Fig. 9 is a cross-sectional view of an inflatable port closure taken along line 9—9 of Fig. 8.

Fig. 10 is an enlarged cross-sectional view of the rod and spring structure taken along line 9—9 of Fig. 8.

As shown in Fig. 1, the structure includes a gas-imperious envelope 1 which is formed by a plurality of panels 2, 3. While the shape of the envelope may be altered to meet varied requirements, the hutment of Fig. 1 is rectangular in plan with an arched roof 4, end walls 5, and side walls 7. A blower 11 for inflating the hutment is provided with a pressure duct 12. This duct is aligned with port 13 in the side wall 7. Pivotably mounted within the envelope over port 13 is a flap valve 14 mounted to pivot to closed position under the influence of gravity and pressure within the envelope during blower shutdown, and thus minimize loss of pressure. When the blower is operating, the flow of air from the pressure duct 12 is sufficient to hold the valve open, for it is extremely light; it is merely a sheet of plastic on a wood frame. The blower air may be heated before being introduced into the hutment if that is desired. Where a low-humidity atmosphere is desired a dehumidifying unit 15 with ducts 16 and 17 may be provided. Although shown used with a separate blower 11, the dehumidifying unit 15 may obviously include a blower of sufficient capacity to obviate the necessity for a separate blower. A double-door airlock 18 of wood or metal construction is aligned with a port 21 in the end wall 5 for ingress and egress. The airlock has an outer door 22 and an inner door 23; this arrangement serving to minimize pressure drop on entering or leaving the hutment.

It will be seen that a large, completely inclosed area has been provided without the use of either internal or external structural members. Erecting a hutment of this kind is a matter of sealing the lower edge of the walls to the ground, if outdoors, or to the floor, if indoors, and turning on the blower. A few minutes of blower operation suffice to inflate a structure of moderate size. It has been found that the blower need maintain a pressure differential of approximately only .002 lbs./sq.² over atmospheric. A pressure difference of this magnitude is sufficient to impart structural stability under normal conditions of usage. It is a characteristic of this kind of structure that considerable air leakage can be tolerated without seriously affecting the stability of the hutment. Air leakage may, in fact, be beneficial in hutments used to house persons in that the air within the hutment is gradually changed through such leakage. It is contemplated that operation of the blower will be substantially continuous.

In Fig. 2 an anchoring and sealing arrangement for the hutment is disclosed. This structure is particularly adapted for outdoor vehicle storage. The hutment is erected on hard stand earth 24 with the desired floor area of the hutment covered with a heavy-duty asphaltic felt liner 25 as a moisture barrier. The hutment wall 7 has a lower edge portion 26 formed of a heavier gauge plastic material. This lower edge portion 26 is secured between an inner wood frame member 27, enclosing the floor area of the hutment, and an outer clincher board 28, the latter fixed to the frame member by spikes or screws 31 which go entirely through the lower edge portion 26. Additional anchoring and sealing may be effected by providing

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an earthen drainage bank 32 exterior of the clincher board, and by a layer of packed earth 33 within the frame 27 and covering the felt liner 25.

Fig. 3 discloses another anchoring and sealing structure, in which an apron 34 of heavy-duty plastic material is provided contiguous with the wall 7. Along the extreme lower edge of the apron 34 are a series of eyelets 35, while at the exterior upper edge of the apron are a complementary series of loops 36. A tie line 37 is provided so that the lower edge of the apron may be drawn toward the upper edge to form a trough. In erecting the hutment a quantity of earth or other anchoring material is thrown on the apron, and then the tie lines are tightened. The hutment is in this way anchored by the weight of the material in the trough, and sealed by the contact of the apron with the ground. In Fig. 3 a trough-like depression 38 was first excavated, the apron was laid over the depression, and then the excavated material was placed on the apron. The depression increases the length of sealing surface and makes the seal somewhat more effective.

The modified anchoring and sealing structure disclosed in Fig. 4 employs a contour tube 41, having filler valve 42, for defining the base of the hutment. This tube is secured to the heavy duty plastic apron 34 at 29 near its line of juncture 39 with the wall of the envelope. The apron is contiguous with the wall of the hutment and extends beyond the line of attachment to the tube. At the lower edge of the apron there is provided a series of eyelets 35 while the outer surface of the tube is provided with a complementary series of buttons or snap loops at 40. A tie line 37 is provided for drawing the lower edge of the apron toward the tube, thus forming a trough for accommodating anchoring material between the lower edge of the apron and the tube. In erecting the hutment, the tube 41 may be filled with water or other suitable fluid, but is preferably filled with air, and the trough is filled with earth or water. The main envelope may then be inflated as before.

In Fig. 5 a further embodiment of the anchoring and sealing structure is disclosed in which a contour tube 41 is secured at the upper end of the heavy-duty plastic apron 34 to define the base of the hutment. A second tube 43 is secured at 44 adjacent the lower edge of the apron and spaced from the contour tube. The apron 34 and the two tubes, which are preferably air-filled, form a trough to contain anchoring material. The lower edge of the apron has a series of eyelets 35 and the contour tubes has a complementary series of buttons or snap loops at 40. A tie line 37 is provided, cooperating with the eyelets and buttons, to give additional structural rigidity to the anchoring and sealing elements.

In Fig. 6 another embodiment of the invention is disclosed in which a tube 41 is secured at 29 to the lower edge of the envelope 1. The tube has a plurality of retaining plates 45 spaced along its upper surface. Each tube retainer has a locking nib 46 projecting upwardly from the surface of the retainer. Cooperating with each of the retainer plates is a stake 47 having a curved keeper arm 48 extending at a substantially right angle to the body of the stake. The curve of the keeper arm is complementary to the surface of the inflated tube. In the keeper arm there is a locking aperture 51 into which the locking nib 46 may project. In erecting a hutment with this type of sealing and anchoring structure, the tube 41 is inflated and then the stakes are driven into the ground adjacent to the retainers with their keeper arms 48 curved over the retainer plates so that the locking nibs 46 lock in the locking apertures 51.

In Fig. 7 there is disclosed a port 52 having closure means including a sleeve 53 concentric with and sealed to the edge of the port and a tie line 54 for sealing off the end of the sleeve. The size of this port can be varied to serve particular purposes; i.e., small ports for observation purposes and larger ones for crawl ports. The tie line may be a rubber band.

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In Figs. 8, 9, and 10 there is disclosed a port-sealing door 55. The door is formed of two inflatable panels 56 and 57. Each panel has four elongate plastic cells in side-by-side relation; each cell sealed to the adjoining cell along a longitudinal seam, as at 58. The panels 56 and 57 are arranged at either side of a mounting rod 61 which is secured to and surrounded by a cylindrical rubber spring 62. The rubber spring has a pair of lips 63 and 64 on opposite sides thereof for receiving flanges 65 and 66, respectively, which are on the inmost cells 67 and 68 of the panels. The spring 62 thus acts as a hinge for panels 56 and 57. A sealing flange 71 is provided peripherally of the door for jamming against the edges of the port, as at 72 in Fig. 9. The sealing flange is secured to the walls of the outermost cells 73, 74 along the sides of the door and is secured to the ends of the cells along the top and bottom of the door. The rod 61 extends below the lower portion of the sealing flange and terminates in a sharpened end 75. It also extends above the upper portion of the sealing flange, terminating there in a head portion 76. In use, the sharpened end 75 of the rod is driven into the ground by striking the head portion 76 after locating the rod centrally in a port. The rod is driven into the ground to a depth such that the bottom portion of flange 71 touches the ground. The cells are then inflated through conventional means as at 77. The side sealing flanges are preferably located to seat against the internal side of the wall 5. In entering or leaving the hutment a panel is pushed or pulled to rotate it about the rod 61, and spring 62 acts to return the panel to sealing position when the entrance or exit has been effected.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit or scope of the invention. For example, a group of hutments of the type disclosed is desirable in certain installations, in which case a central dehumidifier and pressure source may be provided, connected by pressurizing and return ducts to each of the hutments.

I claim:

1. An inflatable hutment having walls and roof formed of a plurality of gas-imperious panels, said hutment adapted to enclose a volume of gas under pressure slightly in excess of atmospheric, pressure means providing a substantially continuous flow of air to the interior of said hutment, pressure-sealing access means in one of said walls, and peripheral anchoring means at the lower edge of said walls for sealing said hutment against the escape of air including a substantially continuous independently inflatable contour tube sealed to the bottom edge of said walls, a plurality of spaced tube retainer plates secured to said contour tube, said tube retainer plates having locking nibs thereon, a plurality of stakes adapted to be driven into the ground, each of said stakes having an arcuate keeper arm extending substantially at a right angle thereto, and means on said keeper arm for cooperation with said locking nib.

2. An inflatable hutment having walls and roof formed of a plurality of gas-imperious panels, said hutment adapted to enclose a volume of gas under pressure slightly in excess of atmospheric, pressure means providing a substantially continuous flow of air to the interior of said hutment, an entrance port in one of said walls, a closure in said port comprising a pair of inflatable cellular panels, said panels being connected to a hollow cylindrical rubber spring at opposite sides thereof, a mounting rod centrally anchored in said port said rubber spring being secured to said rod in surrounding relation thereto, sealing means on said closure for contacting the edge of said port in sealing engagement, and peripheral anchoring means at the lower edge of said walls for sealing said hutment against the escape of air.

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3. An inflatable hutment having walls and roof formed of a plurality of gas-impervious panels, an entrance port in one of said walls, a closure in said port comprising a pair of inflatable cellular panels, said panels being connected to a hollow cylindrical rubber spring at opposite sides thereof, a mounting rod centrally anchored in said port, said rubber spring being secured to said rod in surrounding relation thereto, and sealing means on said closure for contracting the edge of said port in sealing engagement.

4. The structure set forth in claim 3 further characterized in that the said panels form an envelope adapted to confine a volume of gas under pressure slightly in excess of atmospheric pressure, blower means providing a substantially continuous flow of air to the interior of said envelope, pressure-sealing access means in one of said walls, restraining and anchoring means for maintaining said envelope in a designated position, said restraining

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and anchoring means located entirely at the lower edge of said walls and comprising an apron extending the lower portion of said walls and a quantity of anchoring material thereon, said restraining and anchoring means also functioning as a peripheral sealing means in that said apron is maintained in sealing contact with the ground by the weight of said anchoring material.

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