Aug. 29, 1967 R. L. FRASER 3,338,001

INFLATABLE STRUCTURE

Original Filed Jan. 22, 1965 2 Sheets-Sheet 1

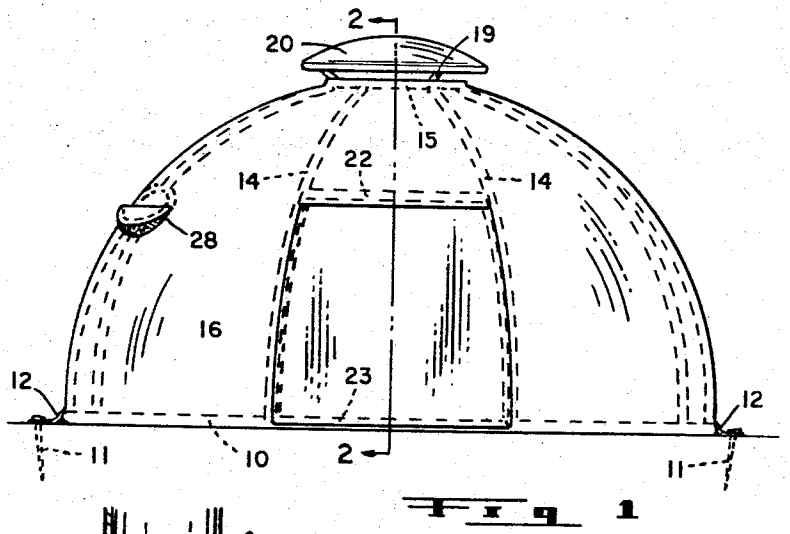

Fig 1

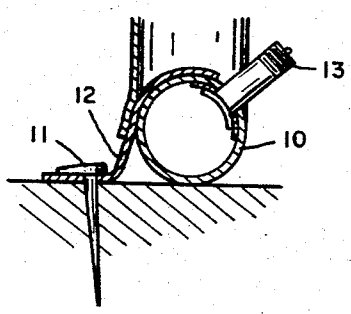

Fig 6

Fig 7

Fig 2

INVENTOR
Robert L. Fraser
by

Walter C. Baggett
Agent

Aug. 29, 1967 R. L. FRASER 3,338,001

INFLATABLE STRUCTURE

Original Filed Jan. 22, 1965 2 Sheets-Sheet 2

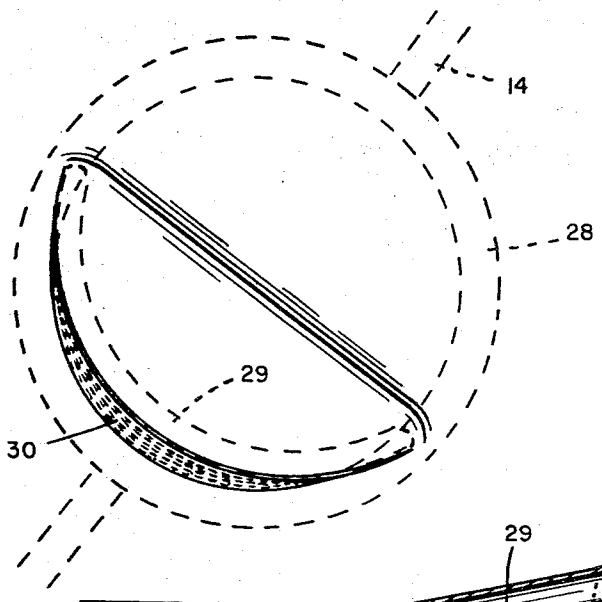

Fig 4

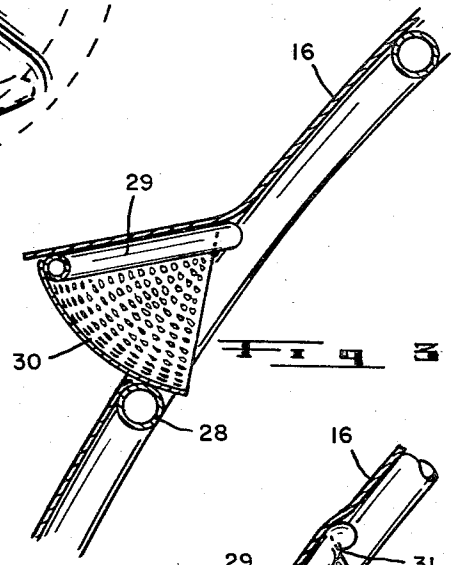

Fig 6

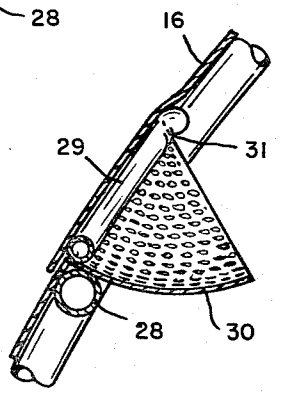

Fig 5

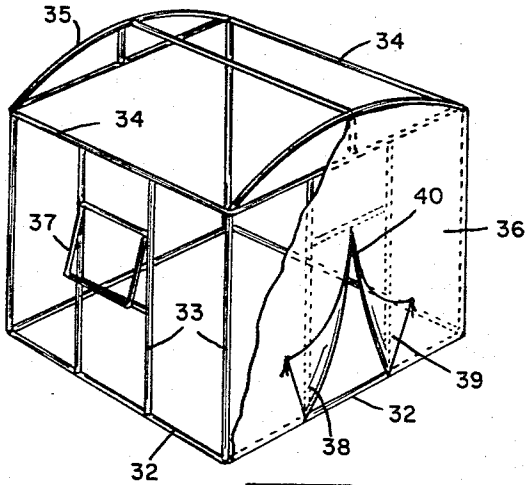

Fig 8

INVENTOR
Robert L. Fraser
by

Walter C. Burgess
Agent

United States Patent Office 3,338,001
Patented Aug. 29, 1967

3,338,001

INFLATABLE STRUCTURE

Robert L. Fraser, Box 131, Dryden, Ontario, Canada

Continuation of abandoned application Ser. No. 427,346, Jan. 22, 1965. This application Nov. 4, 1966, Ser. No. 592,228

4 Claims. (Cl. 52—2)

This invention relates to portable collapsible enclosures for temporary erection as protection shelters against the elements, and is a continuation of my prior application for "Method of Creating a Collapsible Enclosure," filed Jan. 22, 1965, under Ser. No. 427,346 and now abandoned. In producing such structures, the normal practice has been to make use of well known materials such as wood, metal, glass, insulation, woven or flexible fabrics such as canvas, or any combination of these. All such materials are either weighty, bulky or expensive, require hardware, and present varying transportation or storage difficulties, as well as time consuming erection. When a large number are required, as in an emergency, such problems pile up, and if not quickly solved, might even cost lives.

The principal object of the present invention is: to provide an economical thin lightweight structure which can be erected in a minimum of time and merely by the use of an air pump, requires no hardware, and can just as easily be deflated, for extremely compact storage and/or shipment.

A further and more specific object of the invention is: to construct this enclosure with inflatable members, such as sills, ribs, studs, plates and rafters, all in the manner of a conventional building, to support the various sections of the structure, and such that these supports will be fluidly interconnected, for inflation or deflation from a single supply connection.

A further object of the invention is to supply a series of inflatable arms or struts for the doors, windows and ventilators of the enclosure, and such that these members can be manually operated for adjustability of said closure openings.

A further object of the invention is to provide means on the supports for this inflatable structure to anchor same by the use of stakes, in the well-known manner of a tent.

Further objects of the invention are: to design the device in a simple and easily manufactured composite; for low productive costs and therefore reasonable retail sales; of extremely light weight, so relatively little effort will be expended in carrying same, including compactness when folded, for low storage or shipping rates; of waterproof and opaque material, to maintain a dry interior which will be invisible from the outside, although transparent material can be used where entrance of light is desirable; and said light-weight material will also have strong tensile strength for a reasonably long life, and satisfactory service.

With the above important and other minor objects in view, which will become more apparent as the description proceeds, the invention consists essentially in the novel construction and supporting arrangements as well as the design and strategic locations of the various parts hereinafter more particularly described, reference being had to the accompanying drawings wherein like characters of reference indicate corresponding parts in the several figures, and wherein:

FIGURE 1 is a front elevation of a semi-spherical structure built in accordance with the inventive concept.

FIGURE 2 is an enlarged vertical section taken on the line 2—2 of FIGURE 1.

FIGURE 3, on the second sheet of drawings, is an enlarged vertical section of the side ventilator of FIGURES 1 and 2, in open position.

FIGURE 4 is an outer face view of FIGURE 3.

FIGURE 5 is the same as FIGURE 3, but showing the ventilator closed.

FIGURE 6, on the first sheet of drawings, is an enlarged section taken at 6—6 of FIGURE 2 and showing the inflation valve as well as a hold-down for the sill of the structure.

FIGURE 7 is a modified showing of a hinge construction for the door.

FIGURE 8, on the second sheet of drawings, is a perspective view of a square type of enclosure as a modified form of construction.

The basic material used for this shelter is a thin plastic of the poly-ethylene and other synthetic resin families, known commercially under various trademarks such as "Mill Roll" and "Vis-o-Queen." This plastic has the valuable qualities of being very thin and light in weight while having great tensile strength. When made in tubes, and collapsed, it occupies a minimum of space, but when inflated, it fills out to full tube size but no further, even if pressure is increased. This tubular construction can be manufactured both straight and curved, or molded in a series of varying direction tubings, or the tubings can be secured in fluid connection by the use of adhesive. Such tubings therefore, present an ideal inflatable framework material for the support of an outer covering of similar thin sheathing, to provide a strong shelter.

The adaptability of this material for its purpose is well brought out in FIGURES 1 and 2 of the drawings where a semi-spherical or igloo-type of shelter is presented. In this structural arrangement, a circular base tubing or sill **10** is anchored to the ground by stakes **11** which pass through suitable plastic hold-down strips **12**, which may be adhesively secured to the sill therearound (see FIGURE 6). An air valve stem **13** is also secured to the sill at any suitable location, for pump attachment thereto (not shown).

In the semi-spherical framework shown, upstanding curved plastic stud tubes or ribs **14** have their lower ends secured to the sill for fluid connection therewith, while their upper ends turn inward to similarly connect with a circular tubing **15**, which forms a roof ventilator for the structure. The above described framework is now covered with a similar thin plastic sheathing **16**, except over the ventilator opening. A larger ring tubing **17** encircles the tubing **15**, and supports overhead tube rafters **18**, and both ring tubings **15** and **17** are radially and fluidly connected by arm tubings **19**, including the rafters. The ring **17** and rafters **18** form a canopy frame for the opening, and is separately covered and secured to a similar thin sheathing **20**. Accordingly, vent air can pass out the structure through the ring **15** and then down and out past the arms **19**. A rope **21** has one end fastened to the center of the canopy. If the lower end of the rope is pulled, the canopy will be drawn down, to the main framework if necessary, to regulate the size of the ventilator opening, the arms **19** bending to accommodate the movement. When the rope is released, the inflated arms will spring back straight, and return the canopy to its elevated position shown.

As shown in FIGURE 1, a doorway can be provided to the shelter, by fluidly connecting a cross or plate tubing **22** between two of the ribs **14**. A U-shaped tubing **23** has its upper ends fluidly connected to this plate tubing, such that it forms a suspended doorframe over which the sheathing **16** can pass and be secured, vertical slits **24** being cut in the sheathing, at either side of this doorframe, so the door itself can open. If the door is lifted,

or pushed inward or outward, the U-shaped tubing **23** will bend at its end connections, like the arms **19**, for hinging movement partially around the plate tubing **22**, but will return the door to its closed position, when the pressure is removed. If desired, plastic straps **25** (see FIGURE 7) can be secured to the plate tubing **22** to form hinges for a rectangular tubular doorframe **26** to hang on, said doorframe being suitably connected, as by a small tube **27**, with the plate tubing **22** for fluidity therebetween. Such hinges could be used on the door sides, when same is straight and vertical.

While I have shown a ceiling ventilator for the semi-spherical structure of FIGURE 1, it will be appreciated that a side ventilator should also be provided for complete air ventilation through the structure. At the same time, it would be advantageous to have a window to admit light at the same location. These features have been provided in the ring tubing arrangement shown at **28** in FIGURES 1 and 2, the circular interruption here of the curved tubular rib **14** corresponding to the semi-spherical design of the overall shelter.

The details of this side ventilator construction is best shown in FIGURES 3, 4 and 5. A bail-shaped tube **29** is connected centrally and horizontally of the ring tubing **28**, and in fluid connection therewith. The center of this curving tube **29** normally projects outwardly from the main frame at an angle, as shown in FIGURE 3. The upper part of the sheathing **16** passes thereover and is fastened thereto. The lower part of the sheathing is cut to conform with the curvature of the tube **29**. It might be mentioned at this time that the sheathing covering the upper part of the ring tubing **28** and the bail-shaped tube **29** will be transparent, to provide the window.

The space between the lower part of the ring tubing **28** and the bail-shaped tube **29** is closed by a screen **30**. This screen is shaped like an exterior segment of a ball, the outer edge being secured to the tube **29** while the inner edge rests on the bottom part of the ring tubing **28**. By grasping this inner edge of the screen segment, the tube **29** can be pulled down and inward to close off the ventilator, as shown in FIGURE 5, the ends of the tube **29** collapsing, as shown at **31**, to permit this hinging action. Obviously, when the pull is released, the tube, or arm **29** will swing back up, and return the screen to its position, in a similar manner to the upper ventilator and the door. If this segmental screen is fairly stiff, its friction against the lower part of the ring tubing **28** could be utilized to hold it in adjusted positions. On the other hand, if stiffness interferes with the later compact folding of the shelter, it could be made of cheesecloth or other soft woven material having air passage and collapsing characteristics.

From the above disclosure it will be seen that all tubings are fluidly connected and the pump mentioned can inflate them all from the one valve stem **13**, when required. When the stakes **11** are released and the tubings are deflated at the valve stem, the whole superstructure will collapse into a relatively small light mass, having what might be termed flowable flexibility to mold into any kind of a container (not shown), and for storage and shipment, yet ready at a moment's notice for inflation back into a large strong airy shelter, as shown in the drawings.

In FIGURE 8, a design for a flat sided, square cornered inflatable shelter framework is shown, using mostly straight tubings in the conventional manner of sills **32**, studs **33**, plates **34** and rafters **35**. This framework would be completely covered in sheathing **36** in the same manner as for the semi-spherical design. In this framework, a rectangular window frame **37** could be operated as a side ventilator in the manner of the ring ventilator **28** previously described, or it could be hinged in the normal manner of FIGURE 7. Further, in this square design,

the doorway is normally closed by two fold-backs **38** and **39** of the sheathing, which sheathing is centrally slit at **40** in the manner of a tent. Or, it can be door closed in the manner previously explained for the semi-spherical design. The same pegs could be used to hold the sills, and all tubings can be inflated or deflated from a single valve stem (not shown).

While I have described and explained two shelter designs, it will be appreciated that the versatility of this inflatable construction makes it adaptable to many other designs, arrangements and constructions with equal satisfactory results, without departing from the spirit of the invention or the scope of the appended claims.

What is claimed as new is:

1. In a fluid inflatable structure: the combination of an inflatable frame of tubular material including a continuous tubular frame member defining when inflated an air vent at the top of said structure; a flexible skin covering said frame except said air vent; an adjustable closure means for said vent having flexible support means; said support means comprising a plurality of inflatable tubular arms, the lower ends of which are fluidly connected at spaced intervals to said frame member and normally project upwardly therefrom; a dome-shaped fluid inflatable framework supported by and in fluid communication with the upper ends of said arms; a covering panel carried by said framework and forming therewith said closure means; said support means normally urged by inflating fluid therein to a position whereby they project away from said frame member, and hold said covering panel offset from the air vent to keep said vent open; and said support means being collapsible against the force of inflating fluid therein to bring said covering panel into closure engagement with said air vent when said support means is drawn toward the frame member.

2. The device as defined in claim **1** together with manually actuated means connected to said framework of said support means and extending downwardly into the structure whereby the support means may be drawn toward said frame member.

3. In a fluid inflatable structure: the combination of an inflatable frame of tubular material including a continuous tubular frame member partly defining when inflated an air vent at the side of said structure; a flexible skin covering said frame except said air vent; an adjustable closure means for said vent having flexible support means; said support means comprising a flexible tube having a configuration complemental to said frame member and with its opposite ends fluidly connected to said latter member at spaced locations therealong; a covering panel carried by said flexible tube and forming said closure means; said support means normally urged by inflating fluid therein to a position whereby it projects away from said frame member, to hold said covering panel angularly offset from the air vent and keep said vent open; and said support means being collapsible against the force of inflating fluid therein to deflect said covering panel into a substantially coplanar relation with the frame member and close said air vent, when said support means is drawn toward the frame member.

4. The device as defined in claim **1** together with a screen having a configuration complemental to said tube and to said frame member; said screen being secured to said tube and frictionally engaging the frame member, whereby to sustain the closure means in adjusted positions thereon.

References Cited

UNITED STATES PATENTS

1,964,818 7/1934 Hood ..... 52—2

REINALDO P. MACHADO, *Primary Examiner.*