United States Patent [19]

Webb

[11] **3,898,775**

[45] **Aug. 12, 1975**

[54] **INFLATABLE ARENA STRUCTURE**

[76] Inventor: **William B. Webb,** 600 Simonet Dr., Elk River, Minn. 55330

[22] Filed: **Aug. 20, 1973**

[21] Appl. No.: **390,092**

[52] **U.S. Cl.** **52/2**

[51] **Int. Cl.**[2] **E04B 1/34**

[58] **Field of Search** 52/2, 63

[56] **References Cited**

UNITED STATES PATENTS

2,355,248	8/1944	Stevens	52/80
3,042,051	7/1962	Mauldin	52/2
3,059,657	10/1962	Turner	52/2
3,254,457	6/1966	Gedney	52/2
3,497,606	2/1970	Caminker	52/2
3,561,174	2/1971	Schneidler	52/2
3,719,341	3/1973	Harrington	52/2

OTHER PUBLICATIONS

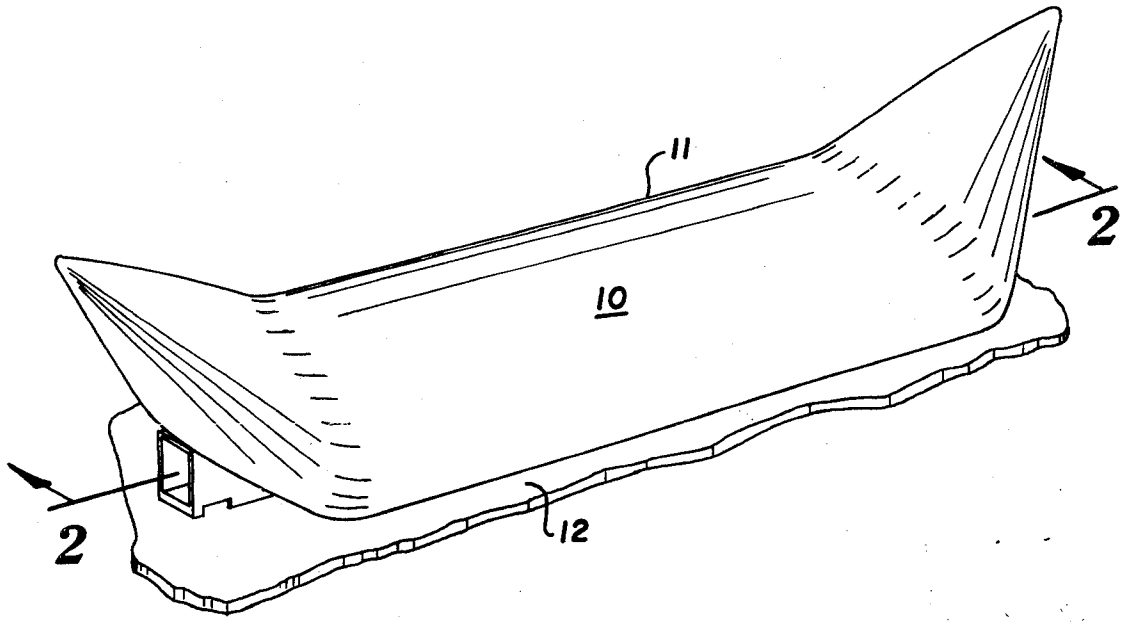
Popular Science, August 1971, pp. 72–75.

Primary Examiner—Frank L. Abbott
Assistant Examiner—Henry Raduazo
Attorney, Agent, or Firm—Orrin M. Haugen

[57] **ABSTRACT**

An air pressure supported structure comprising an envelope of generally flexible sheet material adapted to be maintained in erected disposition by positive fluid pressure provided within the envelope, the sheet material forming the envelope having a generally rectangular configuration and being folded on itself with the ends secured together, the envelope having means arranged to mount the peripheral edges on a generally rectangular support plane so as to provide an erected envelope with overhanging end extensions diverging upwardly and outwardly from the support plane. Means are also provided for personnel access to the envelope, with the chamber including means for readily discharging debris from the interior of the envelope to the exterior thereof.

5 Claims, 8 Drawing Figures



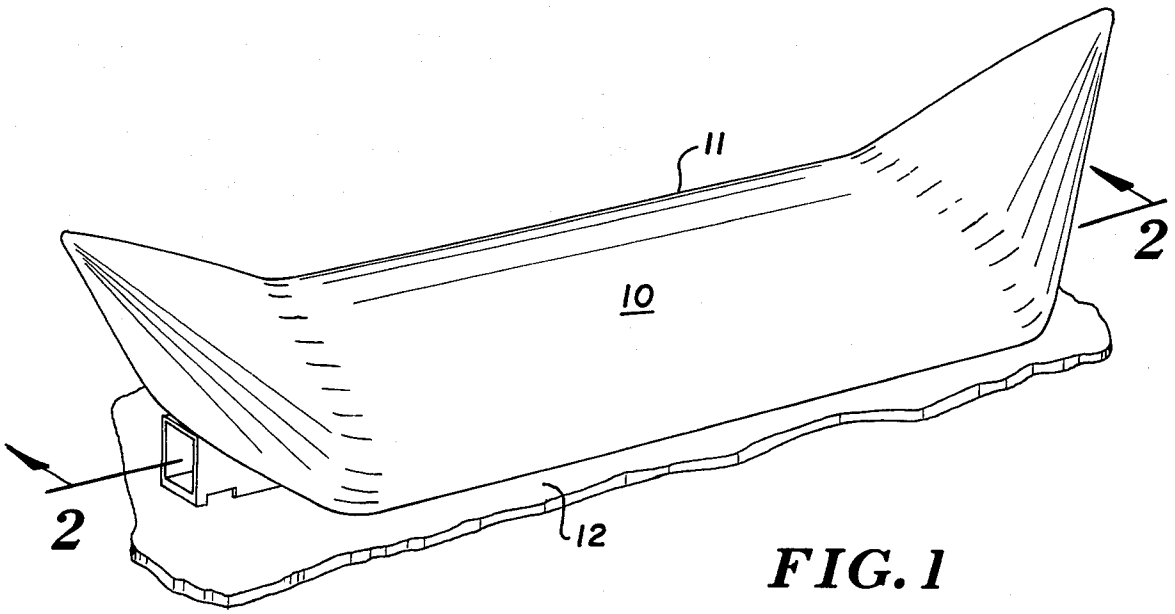


FIG. 1

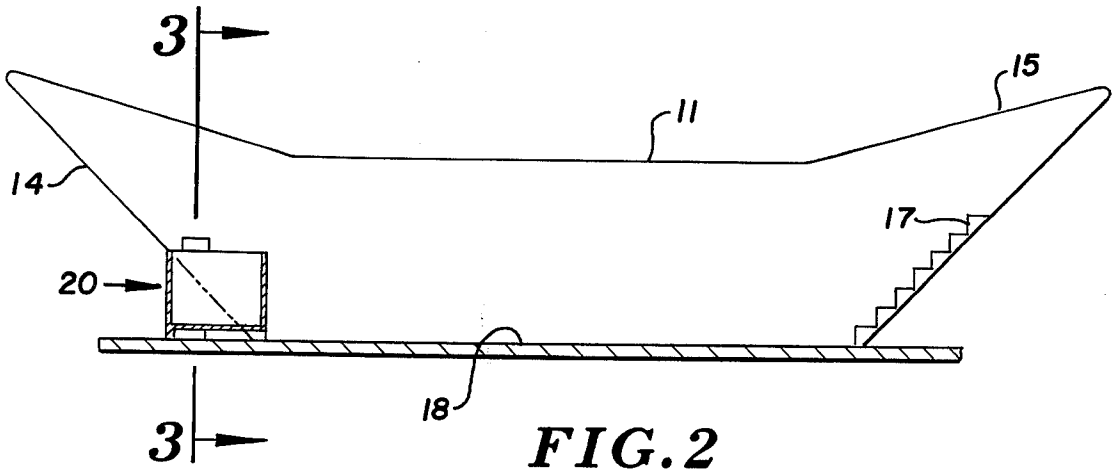


FIG. 2

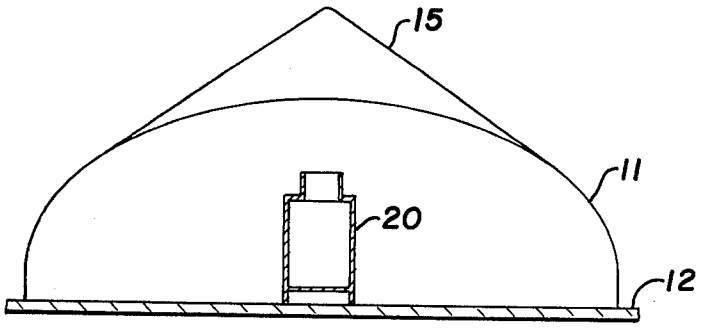


FIG. 3

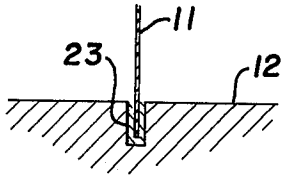


FIG. 4

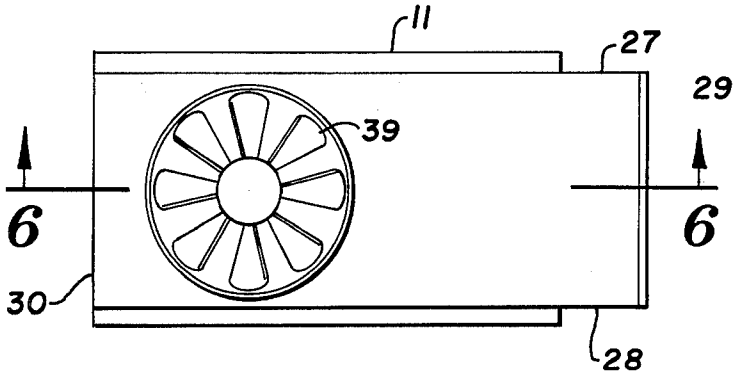


FIG. 5

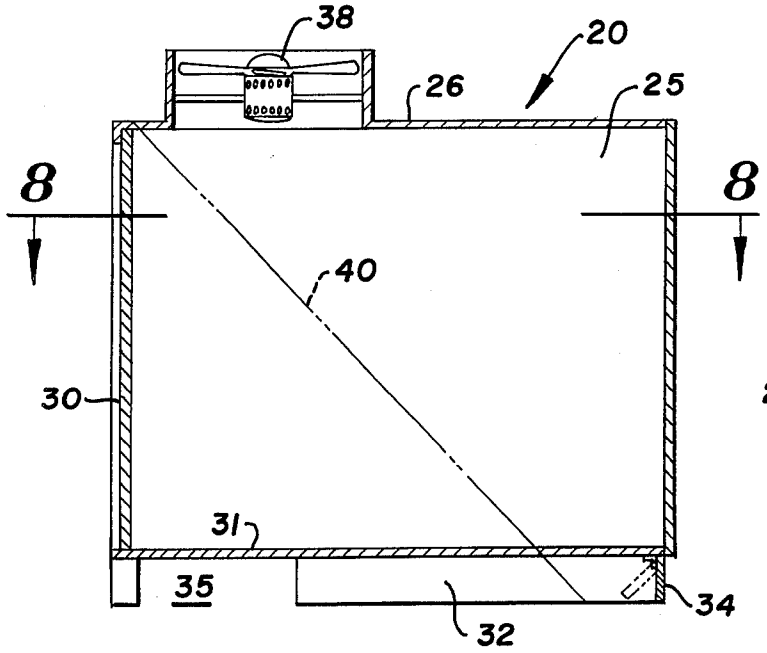


FIG. 6

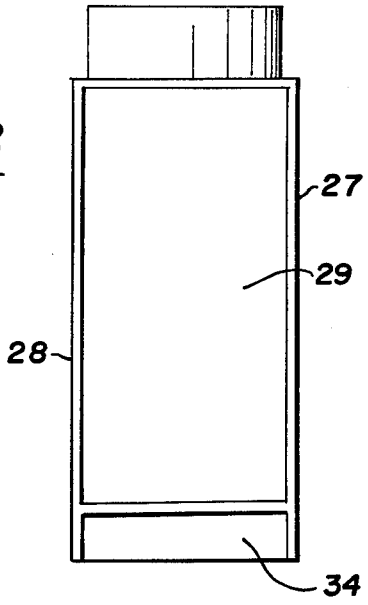


FIG. 7

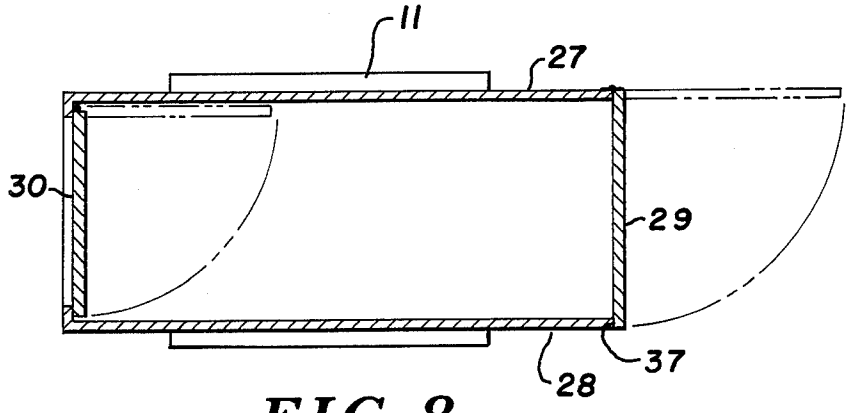


FIG. 8

INFLATABLE ARENA STRUCTURE

BACKGROUND OF THE INVENTION

The present invention relates generally to an improved air pressure supported structure, and more specifically to such a structure which is particularly adapted for an enclosed arena or the like. The air supported structure utilizes an envelope of sheet material having a generally rectangular configuration, with the sheet being folded on itself and joined together at the ends to form a closure, and with means being arranged to mount the peripheral edges of the envelope on a generally rectangular support. This mounting procedure provides an erected envelope with end extensions which diverge upwardly and outwardly from the support plane, so as to provide a useful area within the enclosure for elevated seating.

The air supported structure of the present invention is particularly adapted for use in combination with ice skating rinks, wherein athletic events such as hockey, figure skating, and the like may be conducted in a sheltered environment. In order to maintain the surface of the ice in proper condition for skating, means are provided adjacent the air lock chamber for effective and rapid discharge of debris from the interior of the structure to the out-of-doors. The pressure-head existing within the structure is utilized to force the debris outwardly through a collection chamber, without difficulties being encountered in the discharge.

Air supported structures have been known in the past, and have normally utilized flexible sheet material to form the envelope. This flexible sheet material is commercially available, and may be fabricated from scrim-reinforced films such as Dacron-reinforced Mylar, or from a woven sheet material such as nylon fabric, cotton fabric, or the like. Preferably, the envelope is sufficiently impervious so as to provide ease of inflation without requiring fans of large capacity for maintaining the structure in an inflated condition. Such materials are, of course, widely commercially available. One such material which may be employed is nylon reinforced vinyl, available from Cooley, Inc. of Pawtucket, Rhode Island, under the code name "Armorshell".

SUMMARY OF THE INVENTION

Therefore, it is a primary object of the present invention to provide an improved air pressure supported structure prepared from a generally flexible sheet material which has a generally rectangular configuration, and which is arranged to be mounted with the peripheral edges disposed in a generally rectangular pattern.

It is a further object of the present invention to provide an improved air pressure supported structure which is fabricated from generally flexible sheet material having a substantially rectangular configuration, and wherein the sheet material is mounted with the peripheral edges on a generally rectangular support so as to provide an erected envelope with end extensions overhanging the edge of the support plane.

It is yet a further object of the present invention to provide an improved air pressure supported structure having means for discharging lightweight or pulverulent solid debris outwardly of the chamber.

Other and further objects of the present invention will become apparent to those skilled in the art upon a

study of the following specification, appended claims, and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an inflated air-pressure supported structure prepared in accordance with the present invention, and illustrating the structure disposed over a frozen sheet of ice so as to provide an ice skating arena;

FIG. 2 is a vertical sectional view taken along the line and in the direction of the arrows 2—2 of FIG. 1; and

FIG. 3 is a vertical sectional view taken along the line and in the direction of the arrows 3—3 of FIG. 2;

FIG. 4 is a detail sectional view, with portions of the structure being broken away, and with the showing being on a slightly enlarged scale, this figure illustrating the detail manner in which the edges of the sheet material may be received within the frozen ice sheet;

FIG. 5 is a detail top plan view of the air-lock chamber utilized for personnel access to the interior of the envelope structure;

FIG. 6 is a vertical sectional view taken along the line and in the direction of the arrows 6—6 of FIG. 5;

FIG. 7 is a front plan view of the personnel access chamber illustrated in FIG. 5, and showing the inner door and debris-receiving trap door; and

FIG. 8 is a horizontal sectional view taken along the line and in the direction of the arrows 8—8 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In accordance with the preferred embodiment of the present invention, particularly as illustrated in FIGS. 1–3 of the drawings, the air pressure supported structure generally designated **10** comprises an envelope **11** which is fabricated from generally flexible sheet material, sufficiently impervious so as to be capable of being maintained in erected disposition by positive fluid pressure provided within the envelope. The sheet material has a generally rectangular configuration, and has means arranged to mount the peripheral edges on a support plane, such as the support surface **12.** The edges of the generally rectangular flexible sheet material **11** are mounted on support plane **12** in a generally rectangular configuration, thus providing an erected envelope with end extensions **14** and **15** overhanging and diverging upwardly and outwardly from the support plane **12.** As is indicated in FIG. **2,** bleacher-type seating may be provided in the area of the overhang, such as at **17,** without interferring with the useful area of the enclosure, such as the ice sheet which is illustrated at **18.** It will be appreciated, of course, that ice sheet **18** is coextensive with support plane **12,** and may be utilized as a winter-time shelter for the ice sheet area **18.** Such structures may, of course, be readily established or set up on frozen lake or river surfaces, or may, as an alternative, be disposed within a confines land surface area for the same or other purposes.

In order to provide personnel access to the interior of the envelope, an air-lock chamber generally designated **20** is provided at one end of the envelope, with this chamber preferably housing the air fan which is utilized to generate positive fluid pressure within the confines of the envelope **10.** The details of air-lock chamber **20** will be discussed hereinafter.

In a conventional frozen water surface, such as a river or lake surface, the envelope may be mounted by

merely cutting a channel in the ice surface **12** and is illustrated at **23**, with the sheet material **11** being placed within the confines of the slot **23**, and retained therein by a charge of water poured into the slot **23** and permitted to freeze normally therewithin. The structure will accordingly be readily mounted without difficulty on any frozen surface, and will remain securely locked therewithin until the spring thaw occurs.

In a preferred embodiment of the structure, the rectangular sheet material forming the envelope is prepared from a plurality of rectangular gores, sewn together so as to form a single rectangular envelope. The envelope is folded upon itself along the central elongated axis, and the ends are sewn together or otherwise sealed, thus providing a total enclosure which may be mounted in place.

As can be appreciated, the peripheral dimension of the structure is the total width of the individual rectangular gores multiplied by **2**. Generally speaking, the structures have a length which is 2 times the width, thus providing a suitable enclosure for most purposes. In a typical ice skating environment, and with the peripheral edges being frozen in place on the ice surface, removal is easily accomplished by merely cutting off that portion of the envelope which is submerged below the surface of the ice. The envelope may then be retained and set in place the following season with the identical dimensions being made possible due to the exterior configuration. The only difference in the structure following removal of the submerged portions is that the ceiling height will be somewhat less, however the peripheral dimensions will always remain the same. In other words, the height of the envelope is the only change which occurs from periodic removal of the base portion. Thus, the original shape of the base can be preserved from year-to-year of seasonal use.

Also, it will be appreciated that those portions of the envelope which diverge upwardly and outwardly may be utilized for housing of fans, heaters, lights, and other equipment which is ancillary to the operation of the structure. Also, the area may be used as a maintenance equipment storage zone.

In order to provide sufficient air pressure for the supported structure having an envelope of dimensions **38** ft. by **104** ft., mounted on a support plane with dimensions of **38** ft. by **76** ft., a ½ horsepowder **1725** r.p.m. motor driving a **24**-inch diameter fan blade was found to be sufficient. With different size envelope structures, of course, the mechanism for providing air pressure support may be scaled upwardly or downwardly, depending upon the requirements.

Turning now to the details of the personnel access chamber generally designated **20**, attention will be directed to FIGS. **5–8** inclusive. The personnel access chamber **20** provides an enclosure zone **25** which is bounded by an upper wall panel **26**, and a pair of lateral side panels **27** and **28**. An inner hinged door **29** and an outer hinged door **30** are provided at opposed ends of the enclosure **25** to permit persons to gain ingress into and egress from the interior of the envelope **11**. A support platform **31** is provided along the wall panels **27** and **28**, with platform **31** being disposed at a finite distance above the base of the side panels so as to form a debris chamber **32** below platform **31**. A normally closed trap door means is provided as at **34** which communicates with the debris receiving chamber **32**, and being adjacent and in line with the inner door **29**. A normally open debris receiving port is provided as at **35**, adjacent the outer door **30**, so as to discharge and distribute any solid debris which enters the debris receiving chamber **32** through door **34**. The positive pressure-head which exists within the confines of the envelope will normally be sufficient to readily discharge and evacuate any debris through the chamber **32**. Such an arrangement is particularly useful in connection with ice skating arenas, where the ice surface is treated, from time to time, so as to remove ice chips or flakes from the surface so as to provide an improved sheet.

For materials of construction, the personnel access chamber may be provided from ordinary plywood panels, chipboard panels, or the like, the primary requirement being that these walls have generally impervious characteristics for air.

As is apparent in the description provided in FIG. **8**, the inner door **29** is hinged so as to open inwardly, thus providing a generally constant seal about its periphery, as is illustrated at **37**. The outer door **30** is hinged so as to permit this door to open inwardly a modest amount to provide for make-up air to be driven into the interior of the envelope by fan **38** driving blades **39** in a conventional fashion as described hereinabove.

In order to achieve further impervious characteristics for the structure, the flexible sheet material is secured or otherwise bonded to the outer surface of lateral panels **27** and **28**, such as is illustrated in FIGS. **5** and **8**, with the bond line being shown in phantom at **40** in FIG. **6**.

It will be appreciated that the envelope structure of the present invention is useful in a variety of environments, and may, for example, be utilized in virtually any application where environmental shelter is desired.

I claim:

1. In an air pressure supported structure comprising an envelope of generally flexible sheet material adapted to be maintained in erected disposition by positive fluid pressure provided within the envelope:

a. said sheet material forming the envelope being in the form of a rectangular member with a central axis, a transverse axis and first lateral edge surfaces parallel to said transverse axis, and second lateral edge surfaces parallel to said central axis, and being folded upon itself generally along the said central axis to form a member with a generally rectangular configuration and with the superimposed portions of said first lateral edge surfaces of said rectangular member being secured together to form the envelope;

b. support means arranged to mount the second lateral edge surfaces of said envelope on a generally rectangular support plane so as to provide, upon inflation, an erected envelope with end extensions diverging upwardly and outwardly from said support plane.

2. The air pressure supported structure as defined in claim **1** being particularly characterized in that said generally flexible sheet material is formed from a plurality of generally rectangular shaped segments.

3. The air pressure supported structure as defined in claim **1** being particularly characterized in that said support plane has a length dimension which is approximately twice the width dimension.

4. The air pressure supported structure as defined in claim **1** being particularly characterized in that a personnel access air-lock chamber is provided having an

enclosure with an upper wall panel and a pair of lateral side panels, an inner and outer generally impervious doors at opposed ends thereof and having a support platform disposed at a finite distance above the base of said side panels to form a personnel passage chamber thereover and a debris chamber therebelow, a normally closed trap door means communicating with said debris chamber and being disposed adjacent said inner access door and a normally open debris receiving port disposed adjacent said outer access door.

5. The air pressure supported structure as defined in claim 4 being particularly characterized in that said outer access door is hingedly mounted to one of said lateral side panels and arranged to open inwardly, and fan means are disposed within said chamber supported on said upper wall panel, and duct means establishing communication between said fan and the interior of said envelope for establishing air flow through said outer access door and said fan means.

* * * * *