United States Patent

Strauss

[15] **3,673,975**

[45] **July 4, 1972**

[54] FLOATING PLATFORM

[72] Inventor: **Erwin S. Strauss,** 1015 Laguna St., Suite 10, Santa Barbara, Calif. 93101

[22] Filed: **Jan. 26, 1970**

[21] Appl. No.: **5,486**

[52] **U.S. Cl.**.....**114/43.5,** 114/0.5 R, 114/67 A

[51] **Int. Cl.**.....**B63b 35/44**

[58] **Field of Search**.....114/43.5, 230, 0.5, 0.5 D, 114/67, 67.1

[56] **References Cited**

UNITED STATES PATENTS

2,715,314	8/1955	Smith	114/230 X
3,461,828	8/1969	Bielstein	114/0.5 D
3,468,279	9/1969	Hawkins	114/67.1
3,537,412	11/1970	Henderson	114/0.5 D

FOREIGN PATENTS OR APPLICATIONS

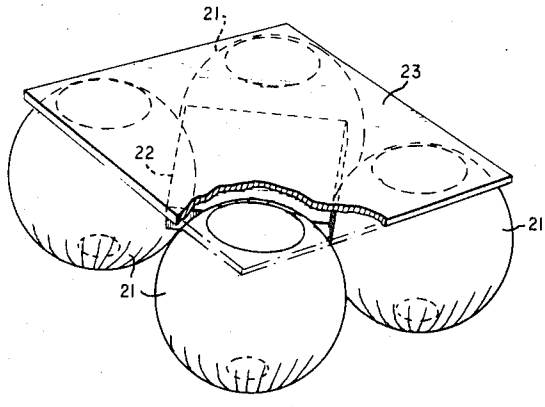
1,475,629	2/1967	France	114/67.1

Primary Examiner—Trygve M. Blix
Attorney—Griffin, Branigan and Kindness

[57] **ABSTRACT**

A floating platform including a plurality of air cells for supporting the platform is described. Each air cell is formed of a large, circular piece of a heavy gauge polyethylene type of material. The material is "pursed" and inverted so that the trapped air cannot escape through the opening remaining after the pursing operation. In addition, means are provided for adding air to the air cells when they contain an insufficient amount of air. The air cells are protected and maintained in position by a skirt that hangs downwardly from the outer edges from the platform. A building or other suitable structure is constructed on the platform. In addition, swingable stairs are provided for mounting the platform from the water level. Further a secondary polyethylene liner is located inside each of the air cells and is deployed if the primary air cell develops a leak.

9 Claims, 6 Drawing Figures



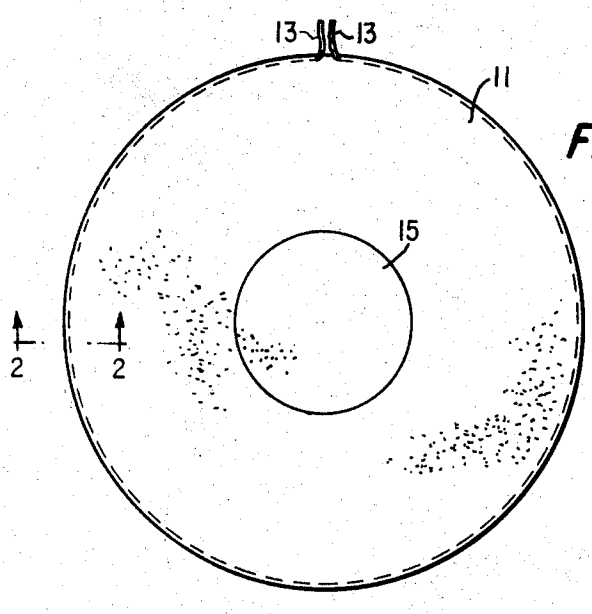


FIG. 1

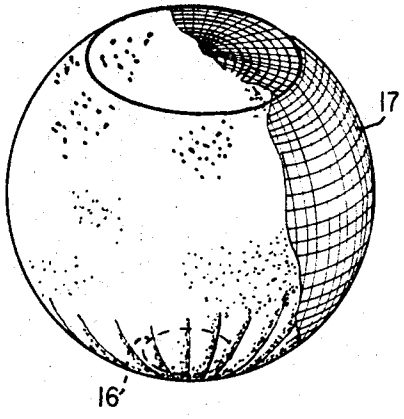


FIG. 3

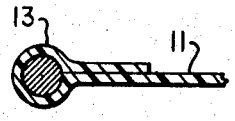


FIG. 2

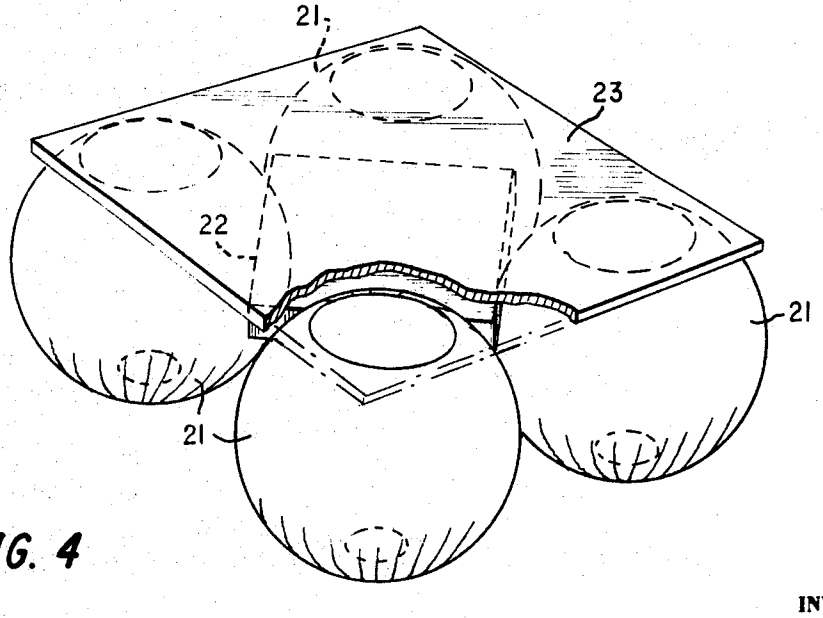


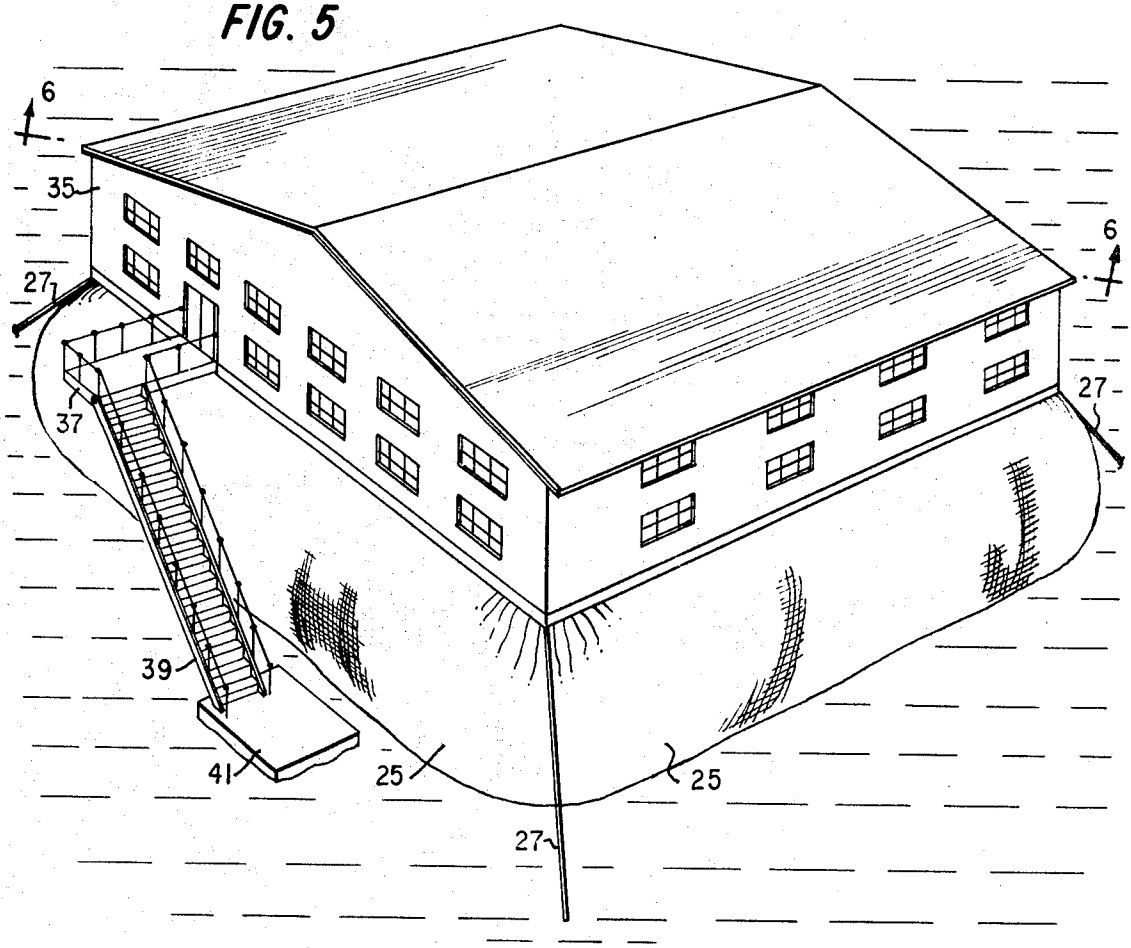
FIG. 4

INVENTOR
ERWIN S. STRAUSS

BY Griffin, Branigan and Kindness

ATTORNEYS

FIG. 5



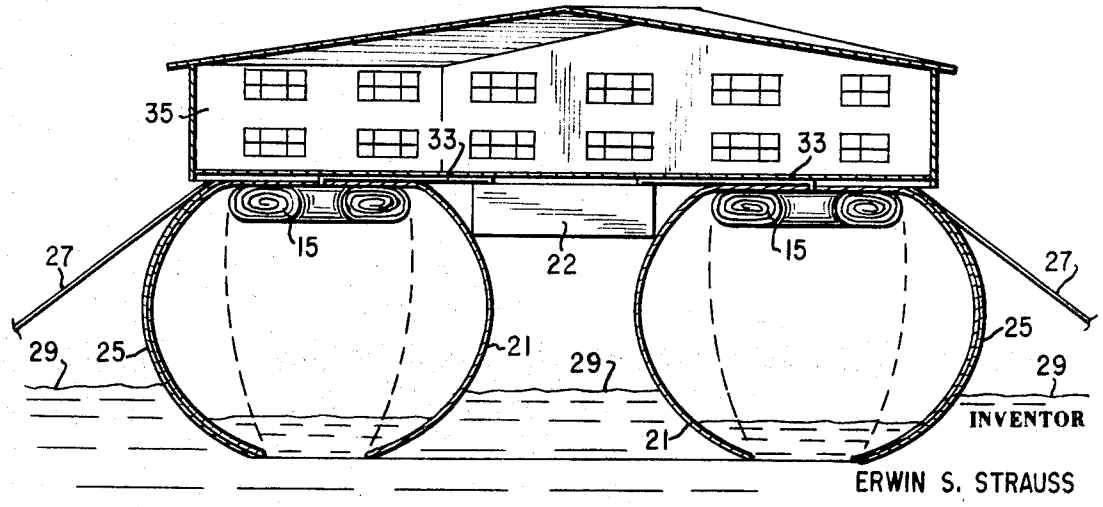


FIG. 6

INVENTOR
ERWIN S. STRAUSS

BY Griffin, Branigan and Kindness

ATTORNEYS

FLOATING PLATFORM

BACKGROUND OF THE INVENTION

This invention is directed to platforms and more particularly to floating platforms suitable for use in the ocean.

Various types of platforms have been proposed for use in the ocean. Some of these platforms are mounted of fixed pilings while others are sufficiently bouyant to float and are anchored at desired locations. While some of these proposed structures have been constructed and are in use, for various reasons, they have not been entirely satisfactory. For example, many of these structures are expensive to produce and maintain because they require extreme structural rigidity. That is, because ocean winds can exceed 150 miles an hour and waves can exceed 50 feet in height, ocean going platforms of the type proposed by the prior art require extreme structural rigidity.

Prior art platforms mounted on pilings have the additional disadvantage of being difficult to move. That is, prior art platforms attached to pilings generally must be dismantled and moved by an ocean going vessel. And, even if floatable, they usually require an extensive period of time to be detached from a set of pilings at one location and an extensive period of time to be reattached to a set of pilings at a different location.

Prior art floating platforms of the type suitable for use in the ocean are also sharply limited in size because large structures require enormous strength to withstand the direct pounding produced by storm waves under storm conditions. Moreover, and often for the same reason, prior art platforms cannot be expanded as desired to provide platforms of increased size. It should be also noted that in some cases prior art platforms have had to be abandoned because of metal fatigue. For example, some of the "Texas Towers" have had to be abandoned for this reason.

Therefore, it is an object of this invention to provide a new and improved floating platform.

It is also an object of this invention to provide a floating platform that is suitable for use in the ocean under storm as well as calm conditions.

It is a further object of this invention to provide a new and improved floating platform that is inexpensive to produce, stable under all ocean conditions and suitable for expansion in size as desired.

SUMMARY OF THE INVENTION

In accordance with a principle of this invention, a floating platform suitable for use in the ocean is provided. The floating platform comprises a plurality of air cells that support a flat platform above the surfaces of the water. Each air cell is formed of a large circular piece of heavy gauge material, such as polyethylene, for example. The material is "pursed" and inverted so that the trapped air cannot escape through the opening remaining after the pursing operation.

In accordance with other principles of this invention, means are provided for adding air to the interior of the air cells when they contain an insufficient air supply after they are initially formed or due to leakage. In addition, a skirt extends downwardly from the outer edges of the platform over the exterior of the air cells to protect the air cells and keep them in place. Further, a nylon mesh is formed over the exterior surface of the air cells to add additional strength and rigidity to the air cells. Moreover, a nylon mesh is formed over the exterior of the skirt to lend additional strength to the skirt.

Preferably, a folded secondary air cell is included within the primary air cell and deployed if the primary air cell develops a serious leak.

In accordance with still further principles of this invention, the width of the air cells is greater than their height when they are slightly compressed due to the weight of the platform and the structure supported on the platform. Further, a hinged stairs is provided and extends from the flat platform to a lower platform or dock that floats on the water's surface at a lower elevation in order to provide access to and egress from the platform. In addition, a structure is formed on top of the platform, the specific nature of the structure being determined by the use to which the floating platform of the invention is put.

It will be appreciated from the foregoing summary of the invention that a floating platform suitable for use in the ocean is provided. Due to the inclusion of large air cells, the platform can take winds in excess of 150 miles an hour. In addition, the platform is reasonably stable even with waves that are 60 feet in height. That is, under normal calm ocean conditions, the platform will be perfectly stable. Under stormy conditions, the platform will not be perfectly stable. However, its instability will not be sufficient to cause difficulty to persons on the platform. In addition to the size of the air cells, ballast formed by water in the lower regions of the air cells provides stability.

It will also be appreciated that the invention is inexpensive to produce due its utilization of inexpensive polyethylene or similar materials to form the air cells. Moreover, the addition of a nylon mesh to the exterior of the air cells and the skirt provides additional protection and strength. Finally, the inclusion of secondary air cells inside of the primary air cells provides additional protection in the unlikely event that one or more of the air cells is seriously punctured.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects and many of the attendant advantages of this invention will become more readily appreciated as the same becomes better understood from the following detailed description when taken in conjunction with the accompanying drawings, wherein:

FIG. **1** is a pictorial diagram illustrating a single air cell prior to being "pursed;"

FIG. **2** is a sectional view along line **2—2** of FIG. **1**;

FIG. **3** is a pictorial diagram illustrating a single air cell after it has been "pursed" and inverted;

FIG. **4** is a pictorial view of a platform supported by four air cells of the type illustrated in FIG. **3**;

FIG. **5** is a pictorial diagram of a floating platform made in accordance with the invention and including a structure; and,

FIG. **6** is a cross sectional view of FIG. **5** along line **6—6**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** is a pictorial view of a large circular sheet of an air tight material **11** which forms the air cells hereinafter described. The diameter of the sheet is, preferrably, 150 feet or greater. The material may be formed of 10 mil polyethylene, for example. However, this is merely an example for the type of material that can be utilized, the only requirements being that it be air tight, deformable and light enough that it can be formed into an air cell structure of the type herein described.

The edges of the large circular sheet of the air tight material **11** are suitably rolled over a draw string **13**, best illustrated in FIG. **2**, which passes around the entire outer periphery of the circular sheet. The rolled over material is suitably attached to the main portion by any suitable manner such as heat sealing, cementing, etc. so as to form a generally contiguous mass.

After the above described structure has been formed, it is "pursed." That is, the draw string **13** is drawn so that a large balloon type structure (primary air cell) of the type illustrated in FIG. **3** is formed. FIG. **3** illustrates the pursed structure after it has been inverted so that an opening **16** lies beneath the structure. While this is the ultimate location of the opening, the primary air cell could be formed with the structure extending downwardly while the pursing action occurs. Thereafter, the entire structure could be inverted. Conversely, the center of the material could be raised while the draw string **13** is pulled so as to form the structure in the inverted position.

FIG. **1** also illustrates a central section **15** which is a deflated secondary air cell. The secondary air cell is identical to the primary air cell except, as viewed in FIG. **6**, it is normally "rolled up." A secondary air cell **15** is dropped and inflated when one of the primary air cells is punctured and loses air.

Also partially illustrated in FIG. 3 is a net 17 surrounding the outer surface of the primary air cell. Preferably, the net is formed of nylon and is applied over the outer surface of the primary air cell, after the primary air cell has been formed. That is, the net is preferably formed by starting with a rectangular piece of netting as long as the outer circumference of the air cell and as wide as the radius of one of the circular pieces of polyethylene used to form the primary air cell. The short ends are joined to form a tube and ropes are threaded through both the top and the bottom rims of the tube, for pursing. The top end is pursed almost shut, and the primary air cell, with the secondary attached as shown in the drawings is inserted into the open end of the netting. A duct leading to a blower source is then protruded through the almost-closed pursing which pursing is then closed as nearly shut as possible. After this, the bottom of the netting is pursed to the desired opening for the bottom of the cell. As can be seen, this action causes ridges to converge at both the top and bottom of the air cell as opposed to ridges converging only at the bottom of the polyethylene primary air cell. Alternatively, the net can be formed as a portion of the material 11 by being molded into the material. In any event, the nylon mesh 17 adds additional structural rigidity to the primary air cell.

It should be noted that primary air cells formed in the foregoing manner are inexpensive to produce. In addition, because they are under low pressure, if they are punctured, a lengthy period of time will pass before they entirely decompress. It should also be noted that while the preferred manner of forming the primary air cells is to purse a sheet of material and trap air, they could be formed in other manners. For example, the primary air cells could be formed entirely as a balloon like structure and filled with air from a suitable air pressure source. Thereafter, a suitable opening could be formed in the lower surface. Alternatively, the primary air cells could be partially pursed and then filled with air to create a suitable internal pressure. In any event, the internal pressure is preferably only slightly above normal air pressure when the primary air cells are used in the manner herein described.

It should be noted that the previously described primary air cells are quite large in size. More specifically, a preferred primary air cell has a spherical diameter of approximately 50 feet so that when it supports a platform in the manner hereinafter described, the platform is 40 feet or more off the water and compresses the primary air cell to a horizontal diameter of approximately 60 feet. In other words, the invention utilizes relatively large — low pressure primary air cells. If desired, the air cells can be formed of a considerably larger spherical diameter than the 50 foot diameter previously stated.

FIG. 4 illustrates a platform 23 supported by four primary air cells 21 formed in the manner heretofor described. The primary and secondary air cells are coupled through hoses or pipes (not shown in FIG. 4) to a compartment 22. The compartment 22 contains suitable means for maintaining the pressure in the primary air cells and creating pressure in the secondary air cells, such as a blower, for example. As illustrated in FIG. 4, the platform is generally square and the primary air cells are equally spaced beneath the platform also in a generally square configuration. The openings in the primary air cells are as previously stated, at the bottom of the cells.

FIG. 5 and 6 also illustrate a floating platform supported by four primary air cells 21 formed in the manner previously described. In addition, a skirt 25 that projects downwardly from the outer edge of the platform 23 is illustrated. The skirt 25 is, preferably, formed of the same material as the primary air cells and has a nylon mesh or netting on one surface to increase its strength and rigidity. Preferably, the skirt and the netting for the skirt that goes outside of it are formed in generally the same manner as the primary air cells and their surrounding netting. That is, a strip of material has its short ends joined which ends are just long enough to fit over the four air cells when they are in place under the platform. When the skirt is fitted over the cells, it holds them tightly together. Then, the top and bottom of both the polyethylene inner and the outer netting are pursed in. The top of the skirt is attached to the platform along the edge for most of the length of each side and the sides of the skirt follow the curve to the flat spot in the cells, caused by the platform's weight, as it goes around the corner. The bottom of each skirt is also pursed in so as to be tangent to the holes in the bottom of each cell.

The addition of a layer of polyethylene over the bottom of the platform to render it airtight, more or less provides an enclosed space which can, in emergencies, act as a big air cell. That is, there is no pressure in this cell except that necessary to hold it stiff against the wind, which pressure may be varied according to wind conditions. However, inflating the cell will cause it to seek a circular shape, which would result in an appearance, viewed from directly above, of an outline similar to the outline of a TV screen — basically square, but with rounded corners and bulging sides. To control the bulging sides, ropes should be run underneath the skirt, at or below the waterline, connecting opposite sides of the skirt. This skirt construction, as a whole, will produce ridges converging at the top and bottom of each corner. The corners will be rounded, rather than coming to edges, as the drawing of FIG. 5 might make them appear.

Anchor ropes 27 extend downwardly from the corners of the platform beneath the water line 29. Anchors on the ends of the anchor ropes anchor the platform to the bottom of the ocean. Alternatively, the anchor ropes can be attached to the bottom of the ocean. If additional anchors are needed, they are connected to the edge of the platform 23 via anchor ropes in the same manner as the corner anchor ropes.

The compartment 22 is attached to the lower surface of the platform 23 at approximately the center of the platform. In addition to pressure maintaining means, the compartment 22 contains generators and motors, and other such items necessary to the operation of equipment located on the platform 23. FIG. 6 also illustrates conduits 33 that pass through the platform to connect the pressure maintaining means in the compartment 22 to both the primary air cells 21 and the secondary air cells 15.

The compartment 22 or some other suitable place on the platform 23 includes out-of-balance sensing devices. When an out-of-balance condition occurs, the pressure maintaining means is caused, either manually or automatically, to compress air and supply it via the conduits 33 to the primary air cell or air cells 21 that are low. The increase in pressure in these air cells causes the platform to rise to a level condition. Alternatively, air could be released from the high primary air cells 21 so as to lower a part of the platform. The pressure maintaining means is also adapted to apply inflating pressure to the secondary air cells 15 if the primary air cells develop a leak and the secondary air cells 15 are dropped into the position generally shown by the dashed lines in FIG. 6.

The pressure maintaining means in the engine compartment also controls the water level in the primary air cells. That is, as can be seen in FIG. 6, water rises to a level inside of the primary air cells 21. The level is dependent upon the weight of the platform, the structure supported by the platform and the pressure in the primary air cells. The water that comes into the primary air cells 21 is effectively coupled to the overall structure and serves as a ballast for the structure. In essence, the principle is the same as that of a submerged drinking glass (all of the air in the glass being exhausted) which is lifted by its bottom out of the water until the lip clears the surface. Until the lip clears the surface, a force sufficient to lift both the glass and the water is required because air pressure holds the water in the glass. Consequently, by regulating the level of water (ballast) in the air cells, compensation is provided for various wind and wave conditions. Air pressure in the primary air cells provides the required regulation.

Mounted on top of the platform 23 is a structure 35. The structure may be a house or any other suitable structure determined by the nature of the intended use of the platform. Extending outwardly from the platform (FIG. 3) is an entry platform 37. Stairs 39 project downwardly from the entry platform to an entry dock 41. Preferably, the stairs are hinged at

the point of attachment to the entry platform **37** so that they can be raised by suitable devices (not shown) under certain conditions, such as when an ocean storm occurs, for example.

It will be appreciated from the foregoing description that the invention provides a floating platform that is useful under ocean conditions, including stormy conditions, and is inexpensive to create and maintain. The platform can be formed of various components. For example creosoted fir lumber provides a low cost, light weight platform that is also corrosion resistant. Alternatively, if greater size and strength are desired, the platform can be formed of light weight steel or metal structural components. Hence, the ultimate size and use of the invention will determine the structural components used in forming the platform as well as the structure mounted on the platform.

It will be appreciated by those skilled in the art and others that various modifications can be made within the scope of the invention. For example, the air cells can be formed in other manners than those previously described. For example, they could be formed as a unitary structure blown up in the same manner that a balloon is blown up. However, an air cell formed in this manner would still require an opening at its lower surface to allow the egress and entry of water to provide the ballast effect previously described. Moreover, a greater number than four (or even three for that matter) air cells can be utilized to support a platform depending upon the size of the platform and its ultimate use. Hence, the invention can be practiced otherwise than as specifically described herein.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A floating platform suitable for use in the ocean comprising:

a plurality of low, slightly above atmospheric, pressure primary air cells, each primary air cell being spherical in shape and formed of an air tight, light weight deformable material, such as polyethylene and the like, each primary air cell having a bottom opening substantially smaller than its diameter to allow water to enter the cell and reach a level adequate to ballast said floating platform; and

a platform mounted on top of said plurality of primary air cells in a generally horizontal plane so as to be able to support a structure.

2. A floating platform suitable for use in the ocean as claimed in claim **1** wherein said spherically shaped primary air cells are approximately 50 feet in diameter prior to being compressed by the weight of the platform and the structure supported on the platform.

3. A floating platform suitable for use in the ocean as claimed in claim **2** including a deflated secondary air cell in each of said plurality of primary air cells.

4. A floating platform suitable for use in the ocean as claimed in claim **3** including pressure maintaining means attached to said platform and connected to said plurality of primary air cells so as to maintain the pressure in said plurality of primary air cells and to said secondary air cell to inflate a corresponding secondary air cell when one of said primary air cells developes a leak.

5. A floating platform suitable for use in the ocean as claimed in claim **4** including a skirt extending downwardly from each edge of said platform.

6. A floating platform suitable for use in the ocean as claimed in claim **5** including a stairway attached to said platform at its upper end and also including a dock attached to a lower end of said stairway at approximately water level.

7. A floating platform suitable for use in the ocean as claimed in claim **1** including a deflated secondary air cell in each of said plurality of primary air cells, said secondary air cells and said primary air cells being formed of polyethylene.

8. A floating platform suitable for use in the ocean as claimed in claim **7** including a pressure maintaining means attached to said platform and connected to said plurality of primary air cells so as to maintain the pressure in said plurality of primary air cells and to said secondary air cell to inflate a corresponding secondary air cell when one of said primary air cells developes a leak.

9. A floating platform suitable for use in the ocean as claimed in claim **8** wherein said spheres are four in number and are approximately **50** feet in diameter prior to being compressed by said platform and the structure supported on said platform.

* * * * *