A high strength inflatable mattress comprises: an upper surface, a lower surface, at least one side surface, a plurality of tightening sheets and at least one gas valve. The upper surface, the lower surface and the side surface have two PVC compound layers and a fiber layer, wherein the fiber layer is disposed between the two PVC compound layers. The side surface comprises PVC compounds, and the side surface is connected to the upper surface and the lower surface by a thermal melting method (such as thermal pressing, ultrasonic welding, or utilizing hot air, RF welding, hot wedge) to form a gas containment space surrounded by the upper surface, the lower surface and the side surface. Each tightening sheet is connected to the upper surface and the lower surface by the thermal melting method too.
HIGH STRENGTH INFLATABLE MATTRESS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention
[0002] The present invention relates to a high strength inflatable mattress, such as a high strength inflatable mattresses suitable for a light-weight dinghy (for example, having a load capacity of less than 15 persons), air mattresses, water flotation devices, tent bed, camp bed, charpoy and etc.
[0003] 2. Description of the Related Art
[0004] Currently, the gas containment space in a high strength inflatable mattress, which may be used in light-weight dinghies, is formed using a neoprene adhesive agent that adheres with a synthetic rubber material, such as Hypalon or Neoprene with the base fabric woven by high-tenacity fibers. However, the cost of this rubber material is quite high, and production of this high strength inflatable rubber mattress requires many adhering processes (for example, to bond the tightening sheet with the outside layer of the high strength inflatable mattress), and these adhering processes require long hardening periods and the adhering areas require polishing. All of these above-mentioned requirements can lead to production periods, which increase manufacturing costs. Some high strength inflatable mattresses are made of a plastic material, which is cheaper, but has poor durability characteristics and also requires long adhering processes.
[0005] Another production utilizes a soft PVC slice strengthening material and a polyurethane adhesive, which requires the addition of a hardener, air drying, as well as thermal and pressure procedures. Therefore, this production method also needs long processing periods.
[0006] Another production utilizes non-strengthened, soft PVC slice materials or thermoplastic polyurethane (TPU) slice materials, and utilizes a thermal melting method, which has lower manufacturing costs; however, the final product has relatively low pressure tolerances, and so is suitable only for children’s toys.
[0007] It is therefore desirable to provide a high strength inflatable mattress which has low manufacturing costs, a fast production period, and high durability, to mitigate and/or obviate the aforementioned problems.

SUMMARY OF THE INVENTION

[0008] A main objective of the present invention is to provide a high strength inflatable mattress which has low manufacturing costs, a fast production period, and high durability, for a light-weight dinghy (for example, having a load capacity of less than 15 persons), air mattresses, water flotation devices.
[0009] In order to achieve the above-mentioned objective, the present invention provides a high strength inflatable mattress which comprises: an upper surface, a lower surface, at least one side surface, a plurality of tightening sheets and at least one gas valve.
[0010] The upper surface and the lower surface have two PVC compound layers and a fiber layer, wherein the fiber layer is disposed between the two PVC compound layers. The side surface comprises PVC compounds, and the side surface is connected to the upper surface and the lower surface by a thermal melting method (such as thermal pressing, ultrasonic welding, or utilizing hot air, RF welding, hot wedge) to form a gas containment space surrounded by the upper surface, the lower surface and the side surface. According the requirement of production speed or maximum pressure, the present invention can be completed with adhesive or without adhesive (faster production).
[0011] A material of the plurality of tightening sheets comprises PVC compounds, each tightening sheet having an upper end and a lower end, and the upper end and the lower end of the tightening sheet are connected to the upper surface and the lower surface by the thermal melting method (such as thermal pressing, ultrasonic welding, or utilizing hot air, RF welding, hot wedge). In the embodiments, the side surface or the tightening sheet can be made of PVC compound or the identical material with the upper surface and the lower surface of the high strength inflatable mattress to improve the durability of the high strength inflatable mattress.
[0012] Other objects, advantages, and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a schematic drawing of a high strength inflatable mattress according to the present invention.
[0014] FIG. 2 is a perspective view of a first embodiment according to the present invention.
[0015] FIG. 3 is a perspective view of a second embodiment according to the present invention.
[0016] FIG. 4 is a perspective view of a third embodiment according to the present invention.
[0017] FIG. 5 is a perspective view of a fourth embodiment according to the present invention.
[0018] FIG. 6 is a perspective view of a fifth embodiment according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] The following five preferred embodiments utilize a high strength inflatable mattress 10 as a base board for a light-weight dinghy 1.
[0020] Please refer to both FIG. 1 and FIG. 2. FIG. 1 is a schematic drawing of a high strength inflatable mattress 10 according to the present invention. FIG. 2 is a perspective, cross-sectional view of a first embodiment according to the present invention. In FIG. 1, the light-weight dinghy 1 (shown as an inflatable boat in this embodiment) comprises a high strength inflatable mattress 10, an annular gas loop 80 and a light-weight dinghy bottom layer 81. The high strength inflatable mattress 10 is disposed within the light-weight dinghy.
[0021] The high strength inflatable mattress 10 comprises an upper surface 20, a lower surface 30, a first side surface 40, a second side surface 50, a gas valve 60 and a plurality of tightening sheets 70.
[0022] In this embodiment, the upper surface 20 and the lower surface 30 of the high strength inflatable mattress 10 each has a lower layer 30, wherein each of the upper layer and the lower layer comprises two PVC layers 21, 31 and a fiber layer 22, 32. The fiber layers 22, 32 are disposed between the two PVC compound layers 21, 31; this combination of materials can provide greater tenacity than prior rubber or plastic materials, and improves the comfort of the
high strength inflatable mattress 10. The fiber layers 22, 32 can be made of synthetic long fibers, such as nylon, or polyester, which impart high strength to the inflatable mattress 10. The fiber content of the fiber layers 22, 32 may range from 150 denier to 2000 denier. The fiber content of the fiber layer may have 10 threads/inch up to 90 threads/inch along a warp direction, and may have 10 threads/inch to 90 threads/inch along a weft direction.

[0023] The PVC compound preferably comprise two primary components; the first is a PVC component (including PVC derivatives), which has about 45% to 70% of a PVC compound, and the other is a plasticizer that has about 20% to 45% of a PVC compound. Please note that the definition of the above-mentioned PVC components in the specification is different from the PVC compounds. In addition, the PVC compound and the fiber layers mentioned above are suitable for use in the following embodiments.

[0024] Please refer to FIG. 2. The material of the first side surface 40 and the second side surface 50 (only one side surface 40 is shown in FIG. 2) comprises a PVC compound (such as PVC film), and the upper surface 20, the lower surface 30, the first side surface 40 and the second side surface 50 form a gas containment space 90. The upper and lower surfaces 20, 30 and the side surfaces 40, 50 may be connected utilizing a splicing method 95 (in which two layers overlap)

[0025] In this embodiment, the gas valve 60 is disposed on the first side surface 40. However, the gas valve 60 may also be disposed on the upper surface 20, the lower surface 30 or the second side surface 50. The user can add or remove gas from the gas containment space 90 through the gas valve 60.

[0026] The gas containment space 90 further includes a plurality of parallel tightening sheets 70 (only one tightening sheet 70 is shown in FIG. 2). Each tightening sheet 70 is used for smoothly connecting the upper surface 20 with the lower surface 30. Since the tightening sheet 70 is utilized in prior art high strength inflatable mattresses, it requires no further description. In the present invention, the tightening sheet 70 is made from a PVC compound (such as PVC tape), and each tightening sheet 70 has an upper end 71 and a lower end 72. The upper end 71 and the lower end 72 of the tightening sheet 70 are connected to the upper surface 20 and the lower surface 30 by a thermal melting method (such as thermal pressing, ultrasonic welding, or utilizing hot air, RF welding, hot wedge). In addition, the tightening sheet 70 in the present invention is ideally an I-shaped tightening sheet.

[0027] In this embodiment, the first side surface 40, the second side surface 50 and the plurality of tightening sheets 70 are made of non-strengthened, soft PVC slice material (such as a material with no fiber layer).

[0028] The following description explains the benefits of using a thermal melting method to connect the first side surface 40 and the second side surface 50 to the edges of the upper surface 20 and the lower surface 30, and to connect each tightening sheet 70 to the upper surface 20 and the lower surface 30. When the manufacturer makes the high strength inflatable mattress 10, many adhering processes are required (for example, when providing the connection between the tightening sheets 70 and the outside layer of the high strength inflatable mattress 10). However, the adhering processes take a long time, which leads to higher manufacturing costs. When the manufacturer uses a thermal melting method in the manufacturing cycle, the connection between different materials can be completed in less time. The PVC compound is a mixed material of PVC, plasticizers, finishing agents, additives and modifiers, and is shaped by a thermforming method. The PVC compound is a thermal plastic, which can undergo several thermal melting processes. When a thermal melting method, such as hot pressing, ultrasonic welding, using hot air, or any combination thereof is performed, since the PVC compound itself is an adhesive material, there is no need to use additional adhesives to form the gas containment space 90.

[0029] Please refer to FIG. 3. A difference between the second embodiment and the first embodiment is that in the second embodiment, the first side surface 40 and the second side surface 50 are made of materials that are identical to, or similar to, the materials of the upper surface 20 and the lower surface 30; in other words, the first side surface 40 and the second side surface 50 also each has two PVC compound layers 41, 51 and a fiber layer 42, 52, wherein the fiber layer is disposed between the two PVC compound layers 41, 51.

[0030] Please refer to FIG. 4. A difference between the third embodiment and the second embodiment is that in third embodiment, the plurality of tightening sheets 70 are made of identical or similar materials as the upper surface 20 and the lower surface 30. That is, each tightening sheet 70 also has two PVC compound layers 73, and a fiber layer 74, and the fiber layer is disposed between two PVC compound layers 73.

[0031] Next, please refer to FIG. 5. In the fourth embodiment of the present invention, a high strength inflatable mattress 10a for a lightweight dinghy 1, the plurality of tightening sheets 70 are disposed along a different direction in the gas containment space 90.

[0032] Please refer to FIG. 6. In the fifth embodiment of the present invention, a high strength inflatable mattress 10b has a circular shape, and so there is only one side surface 40b. Therefore, this embodiment shows that the number of side surfaces can vary; for example, when the high strength inflatable mattress has a circular or oval shape, there is only one side surface. On the other hand, there can be more than two side surfaces, for example, when the high strength inflatable mattress has a triangular or rectangular shape.

[0033] Although the present invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. A high strength inflatable mattress which can be inflated status or deflated status, the high strength inflatable mattress comprising:

   an upper surface;

   a lower layer, wherein each of the upper layer and the lower layer comprises two PVC compound layers and a fiber layer, wherein the fiber layer is disposed between the two PVC compound layers;

   at least one side surface, wherein a material of the side surface comprises PVC compounds, and the side surface is connected to the upper surface and the lower surface by a thermal melting method to form a gas containment space surrounded by the upper surface, the lower surface and the side surface;

   a plurality of tightening sheets, wherein a material of the plurality of tightening sheets comprises PVC compounds, each tightening sheet having an upper end and a lower end, and the upper end and the lower end of the
tightening sheet are connected to the upper surface and the lower surface by the thermal melting method; and at least one gas valve disposed at one of the following positions: on the upper surface, on the lower surface or on the side surface, and a user can use the gas valve to inflate or deflate the gas containment space.

2. The high strength inflatable mattress as claimed in claim 1, wherein the side surface has two PVC compound layers and a fiber layer, wherein the fiber layer is disposed between the two PVC compound layers.

3. The high strength inflatable mattress as claimed in claim 1, wherein each of the tightening sheets has two PVC compound layers and a fiber layer, wherein the fiber layer is disposed between the two PVC compound layers.

4. The high strength inflatable mattress as claimed in claim 2, wherein each of the tightening sheets has two PVC compound layers and a fiber layer, wherein the fiber layer is disposed between the two PVC compound layers.

5. The high strength inflatable mattress as claimed in claim 4, wherein the upper surface, the lower surface and the side surface are all connected by a splice method.

6. The high strength inflatable mattress as claimed in claim 1, wherein the fiber layer has synthetic long fibers.

7. The high strength inflatable mattress as claimed in claim 2, wherein the fiber layer has synthetic long fibers.

8. The high strength inflatable mattress as claimed in claim 5, wherein the fiber layer has synthetic long fibers.

9. The high strength inflatable mattress as claimed in claim 6, wherein the fiber of the fiber layer is from 150 denier to 2000 denier.

10. The high strength inflatable mattress as claimed in claim 8, wherein the fiber of the fiber layer is from 150 denier to 2000 denier.

11. The high strength inflatable mattress as claimed in claim 10, wherein the fiber of the fiber layer has from 10 threads/inch to 90 threads/inch along a warp direction, and has 10 threads/inch to 90 threads/inch along a weft direction.

12. The high strength inflatable mattress as claimed in claim 1, wherein the PVC compound has a plasticizer and a PVC material.

13. The high strength inflatable mattress as claimed in claim 12, wherein the PVC material is about 45% to 70% of the PVC compound and the plasticizer is about 20% to 45% of the PVC compound.

14. The high strength inflatable mattress as claimed in claim 2, wherein the PVC compound has a plasticizer and a PVC material.

15. The high strength inflatable mattress as claimed in claim 14, wherein the PVC material is about 45% to 70% of the PVC compound and the plasticizer is about 20% to 45% of the PVC compound.

16. The high strength inflatable mattress as claimed in claim 4, wherein the PVC compound has a plasticizer and a PVC material.

17. The high strength inflatable mattress as claimed in claim 16, wherein the PVC material is about 45% to 70% of the PVC compound and the plasticizer is about 20% to 45% of the PVC compound.

18. The high strength inflatable mattress as claimed in claim 9, wherein the PVC compound has plasticizer and PVC material.

19. The high strength inflatable mattress as claimed in claim 18, wherein the PVC material is about 45% to 70% of the PVC compound and the plasticizer is about 20% to 45% of the PVC compound.

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