Nov. 10, 1964 P. N. DUNHAM 3,155,991

MATTRESS WITH PUMP AND METHOD FOR FORMING SAME

Filed July 18, 1961

Fig 1.

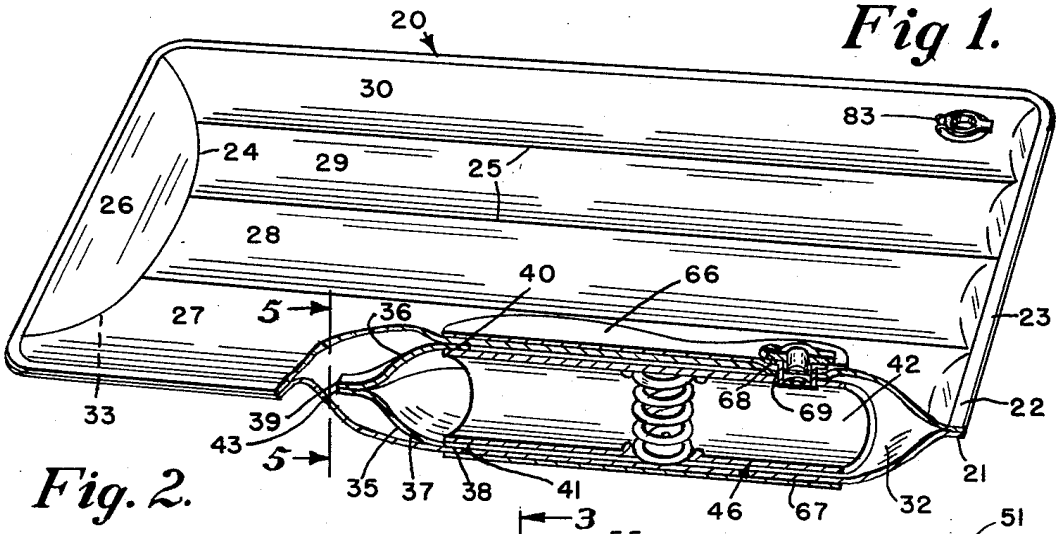
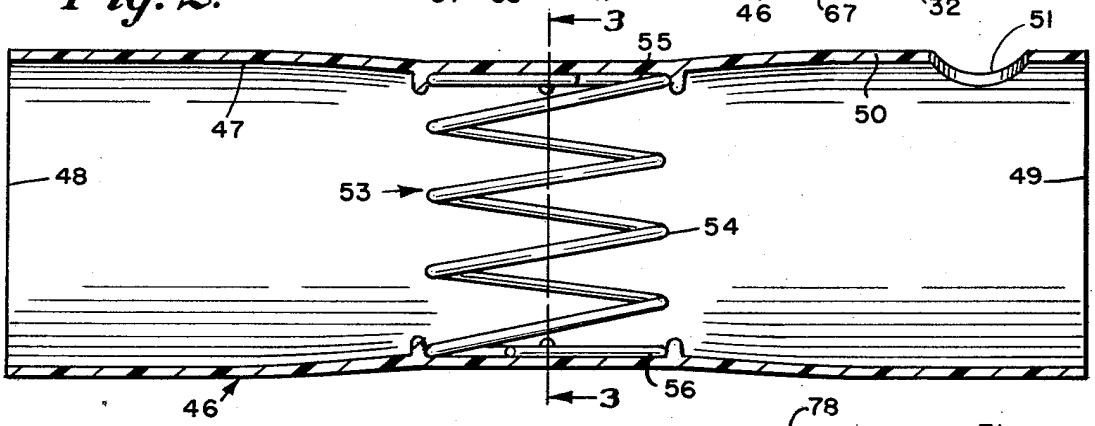


Fig. 2.



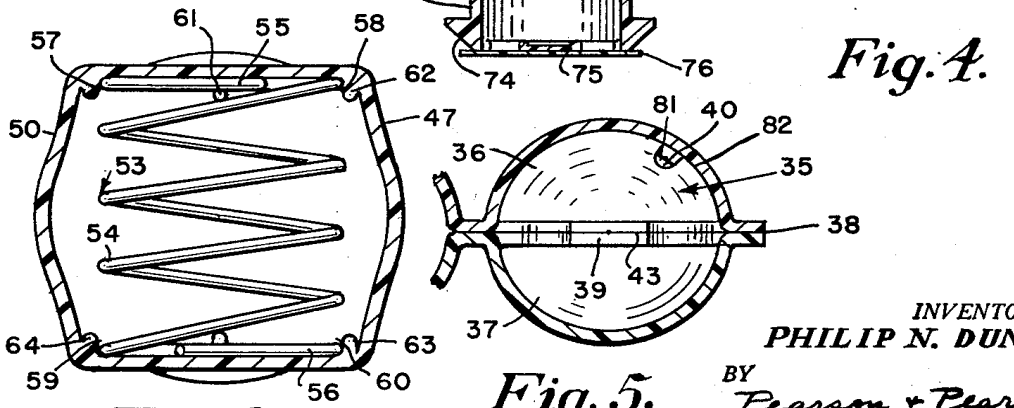


Fig. 3.

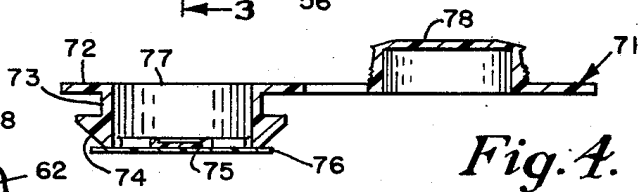


Fig. 4.

Fig. 5.

INVENTOR.
PHILIP N. DUNHAM
BY Pearson & Pearson
ATTORNEYS

United States Patent Office

3,155,991
Patented Nov. 10, 1964

3,155,991

MATTRESS WITH PUMP AND METHOD FOR FORMING SAME

Philip N. Dunham, Nashua, N.H., assignor to Hampshire Manufacturing Corporation, Nashua, N.H., a corporation of New Hampshire

Filed July 18, 1961, Ser. No. 124,936
12 Claims. (Cl. 5—348)

This invention relates to inflatable, cellular mattresses of the self-contained air pump type and especially to an improved pump formed in one of the cells of such a mattress.

It has heretofore been proposed to provide suitable air inlet and air outlet valves in a cellular mattress whereby one of the cells becomes an air pump chamber for inflating the mattress. If the material of the mattress is especially resilient, thick and self supporting, such a pump chamber may gradually distend itself after flattening but the distension is slow and the material is expensive and difficult to fold into a compact package.

In the trade, therefore, inflatable air mattresses for use on the beach or the like, are usually made of relatively thin plastic material and a pump chamber in a cell of this type of mattress will not distend properly after flattening. To distend the pumping cell or chamber, various expedients have been proposed such as foam rubber filling the chamber, deformable, resilient ribs around the chamber or a complete air bag, with accordian type walls, inserted in the chamber.

All of these expedients are subject to one or more disadvantages in that the added cost of material or labor required makes the product impractical or the pumping action is uncomfortable to the foot and too slow to satisfy the user.

It is the object of this invention to provide a low cost, rugged, self contained pump in a cellular, inflatable mattress wherein the distension of the pump chamber is instantaneous as soon as foot pressure is released.

Another object of the invention is to provide a cellular inflatable mattress of plastic sheet material with a built-in pump by heat sealing a fish tail valve of similar material across a cell, inserting a resilient plastic tube containing a metal coil spring into the cell and then closing the end of the cell by heat sealing.

A further object of the invention is to provide cell distending means for a cellular pump chamber of a mattress, in the form of an open ended, elongated, self supporting plastic tube and to provide tube distending means in the form of a helical coil spring of metal, the spring being large enough and strong enough to quickly restore the tube to its normal hollow cylindrical configuration.

Still another object of the invention is to provide a plastic tubular cell distender with inwardly projecting studs for securing a metal coil spring intermediate of the length thereof and with oppositely disposed arcuate recesses in the interior face thereof for seating the opposite ends of the spring.

A still further object of the invention is to provide a plastic tubular cell distender having a metal coil spring intermediate of the length thereof and having an aperture in its wall for receiving a pump inlet valve to thereby secure the tube in a cell of a mattress.

Other objects and advantages of the invention will be apparent from the claims, the description of the drawing and from the drawing in which

FIG. 1 is a perspective view of an inflatable, cellular mattress with a portion broken away to show the self-contained pump in half section,

FIG. 2 is an enlarged side elevation of the cell distending means and tube distending means of the invention,

FIG. 3 is an end elevation in section on line 3—3 of FIG. 2,

FIG. 4 is an enlarged side elevation, in half section of the air inlet valve, and

FIG. 5 is an enlarged end elevation, in section on line 5—5 of FIG. 1, showing the air by-pass conduit.

In the drawing, 20 represents an inflatable, air tight mattress, or sack, preferably formed of two sheets of impervious plastic sheet material 21 and 22 heat sealed on the edges, as at 23, and along interior lines of joinder, 24 and 25, to form a plurality of pneumatically connected air cells such as 26, 27, 28, 29 and 30. At least one cell, for example cell 27, has a dead, or closed, end 32, the other end 33 of the cell being connected to cell 26 which in turn is connected to the remaining cells of the mattress 20.

To convert a portion of the cell 27 into a pump, a combined partition and air outlet valve is provided in the form of the fish tail valve 35. Valve 35 is formed of two identical sheets of flexible, impervious plastic sheet material 36 and 37, heat sealed along each side edge, as at 38, and open at the reduced end 39 and at the enlarged end 40. The enlarged end 40 of valve 35 is heat sealed to the interior face of the wall 41 of cell 27 whereby a pump chamber 42 is defined between the valve 35 and the closed end 32 of the cell. The opening in the reduced end 39 of valve 35 constitutes a one way air outlet port 43 since air under pressure can pass from pump chamber 42 into the remainder of the cells but cannot pass back into the pump chamber, through the port 43.

Cell distending means 46 is mounted within the pump chamber 42 and comprises tube 47 of soft, deformable, self-supporting, plastic material, such as polyethylene, open at each opposite end 48 and 49 and substantially co-extensive in length and cross section with the chamber 42. Tube 42 is normally of hollow, cylindrical configuration to fully distend the cell 27 and the wall 50 of the tube includes an inlet valve aperture 51. Although tube 47 is flexible and resilient it has been found that when such a tube is compressed during foot pumping of the mattress reaction to full distention is relatively slow and pumping therefore prolonged.

Tube distending means 53, therefore, extends transversely across the interior of tube 42, intermediate of the length thereof, to quickly restore the tube to normal cross section when foot pressure is removed. Means 53 is a helical coil spring 54 of metal having opposite ends 55 and 56. The tube 42 includes four arcuate recesses 57, 58, 59 and 60 in the interior face of wall 50 for seating the ends 55 and 56 of the spring as best shown in FIG. 3. As best shown in FIGURES 2 and 3, while the open ended tube 42 is of cylindrical cross section at each opposite end, the arcuate recesses 57, 58 and 59, 60 form an intermediate tube portion of generally rectangular cross section with a flat top and bottom wall section for seating and anchoring the opposite ends 55 and 56 of the coil spring. A plurality of integral, inwardly projecting, spaced studs such as 61, 62, 63 and 64 are also provided in the wall 50 of tube 47 to encircle and secure the ends 55 and 56 of the spring.

Preferably a flexible foot pad 66 is heat bonded to the exterior of the wall 41 of cell 27 and co-extensive in length and width with the pump chamber 42. The pad 66 may be of any suitable flexible sheet material, such as polyethylene, and strengthens the mattress in the area of foot pressure. Preferably also, a second pad 67, substantially identical with pad 66, is heat sealed to the under face of the mattress to protect the pump chamber when the mattress is inflated on the beach or other uneven surface.

Pad 66 includes an aperture 68 and the cell wall 41 includes an identical aperture 69, both of which register with the aperture 51 in tube 47 for receiving the air inlet valve 71.

As shown in FIG. 4, inlet valve 71 is tubular with an upper flange 72, a constricted neck 73 and a tapered lower flange 74, the inner end 75 being closed by a disc 76 of flexible sheet material. Disc 76 forms a one way air inlet port since the disc flexes to pass air into the pump chamber 42 but straightens to close the end 75 during the pumping stroke. The outer end 77 of the tubular valve 71 is closed by the integral plastic cap 78.

In assembling the mattress, a form carrying the fish tail valve 35 at one end, is inserted in cell 27 with the cell and valve flat. A foot pad 66 and a lower pad 67 are placed on the exterior of the cell and the pads are heat sealed to the exterior while the periphery of the enlarged end 40 of the valve is heat sealed to the interior of the cell. The tube 53 with the spring 54 in place, is then inserted in the cell 27. The upper pad aperture 68 and the mattress aperture 69 are then formed in registration with aperture 51 and the tapered lower flange 74 of valve 71 is then snapped through the apertures into the tube 47. Aperture 51 thus becomes the female member and valve 71 the male member of snap fastener means for anchoring the tube 47 against rotation, or lengthwise movement in cell 27. The edges 23 are then sealed to close cell 27 and form the pumping chamber 42.

As shown in FIG. 5, the periphery of the enlarged end 40 of fish tail valve 35 is heat sealed entirely therearound except for a single gap, or holiday 81 in the heat weldment 82. The gap 81 constitutes an air conduit by passing the outlet port 43 and permitting air to enter the chamber 42 from the remaining cells and to balance the air pressures.

An air outlet valve 83 is provided for deflating the mattress, the valve 83 being similar to valve 71. Deflection of the flexible valve disc by a suitable instrument, or by the finger, permits the escape of air when the cap has been removed. In view of the folding of the mattress into a compact package when deflated, valves 71 and 83 must be of material which is not damaged, permanently deformed or fractured when so folded. If too flexible on the other hand, the valves may not function properly. Valves of polyvinyl chloride having a durometer of 60 have been found to be satisfactory for the purpose. The mattress 20 and fish tail valve 35 are also of polyvinyl chloride but the tube 47 is preferably of polyethylene.

I claim:

1. In an air tight, inflatable mattress having a plurality of pneumatically connected air cells including at least one cell closed at one end, and having a cell wall, the combination of a fish tail valve of flexible sheet material extending across, and having one end peripherally affixed to the wall of, said one cell and defining a pump chamber between said valve and said closed end, said fish tail valve having a one way air outlet port for delivering air from said chamber to the remainder of said cells; a one way air inlet valve in the wall of said one cell for supplying air to said chamber; cell distending means within said chamber comprising an elongated, open ended tube of soft, deformable, self supporting plastic substantially co-extensive in length with said chamber and normally of hollow cylindrical cross section and metal spring tube distending means extending transversely across the interior of said tube for rapidly restoring said tube to normal cross section after flattening.

2. A combination as specified in claim 1 wherein said metal spring tube distending means is in the form of a helical coil and said tube includes an intermediate portion of generally rectangular cross section for seating and anchoring said spring against angular movement therewithin.

3. A combination as specified in claim 1 wherein said open ended tube includes an aperture in the wall thereof and said inlet valve includes male means snap fastened in said aperture for securing said tube within said cell.

4. A combination as specified in claim 1 wherein said fish tail valve is unitary and formed of two identical, tapered sheets of plastic heat sealed along the side edges but open at each opposite end, the larger end of said valve being the end peripherally secured to said cell wall.

5. A combination as specified in claim 1 wherein said fish tail valve is heat bonded around its periphery to the wall of said cell, except for a single gap, said gap forming a pneumatic by-pass from said pump chamber to the remainder of said one cell.

6. A combination as specified in claim 1 wherein said metal spring tube distending means comprises a helical coil spring extending transversely of said tube, said tube includes a plurality of inwardly projecting integral studs for securing said spring therewithin and said tube includes oppositely disposed arcuate recesses in the interior face thereof, forming flat top and bottom wall sections for seating the opposite ends of said spring.

7. A combination as specified in claim 1 plus a flexible foot pad of sheet plastic material heat bonded to the exterior face of said cell and substantially co-extensive in length with said pump chamber, said foot pad having an aperture for receiving said one way air valve.

8. In a cellular, air tight, inflatable mattress the combination of an elongated, hollow, cylindrical, open ended tube of soft, deformable, self supporting plastic material mounted within one of the cells of said mattress for normally distending said cell; a pump inlet valve fixed to said mattress and attached to said tube for securing said tube in said cell; a fish tail valve of flexible plastic sheet material, having a one way air outlet port, said valve being fixed to said mattress across said cell and forming a pump chamber within said cell substantially co-extensive in length with said tube; spring means positioned intermediate of and extending across said tube for rapidly restoring the normally, hollow cylindrical configuration thereof after said tube and cell have been flattened and an intermediate portion of substantially rectangular cross section in said tube, for anchoring said spring means therewithin.

9. A combination as specified in claim 8 wherein said fish tail valve includes an air conduit by passing said one way air outlet port for balancing the air pressures within said pump chamber and the remainder of said cells.

10. A combination as specified in claim 8 wherein said tube includes an aperture constituting the female member of snap fastener means and said pump inlet valve is a hollow tube having a tapered exterior face shaped to form the male member of said snap fastener means whereby said tube is secured in said cell when said valve is snapped into said aperture.

11. A combination as specified in claim 8 wherein said spring means is a metal coil spring extending transversely within said tube and said intermediate portion of said tube includes a plurality of integral spaced studs projecting inwardly from the inner face of said tube to encircle each opposite end of said spring.

12. A self inflating mattress comprising an air impermeable sack having a plurality of elongated, parallel air cells pneumatically connected to each other, at least one said cell having a dead end and a predetermined cross sectional area when inflated, an elongated, normally hollow cylindrical tube of soft, deformable, self-supporting plastic material closely fitting within and distending said cell, said elongated tube having one open end proximate the dead end of said cell and having an opposite open end in pneumatic communication with said cells; a fish tail valve of plastic sheet material forming a partition across, and peripherally affixed to, said cell proximate said opposite open end of said tube to enclose said tube in a pump chamber; an air conduit by-passing said

fish tail valve and connecting the interior of said pump chamber with said cells; a coil spring intermediate of said tube for quickly distending the same, and combined snap fastener and inlet air valve means including a rimmed, tubular valve body having its rim secured to the material of said sack and its tubular portion detachably fixed to said tube for securing said tube against movement lengthwise of said pump chamber and cell.

References Cited in the file of this patent

UNITED STATES PATENTS

2,068,134	Houghton	Jan. 19, 1937
2,423,890	Hurt	July 15, 1947
2,664,241	Sunday	Dec. 29, 1953
2,839,073	Marsh	June 17, 1958